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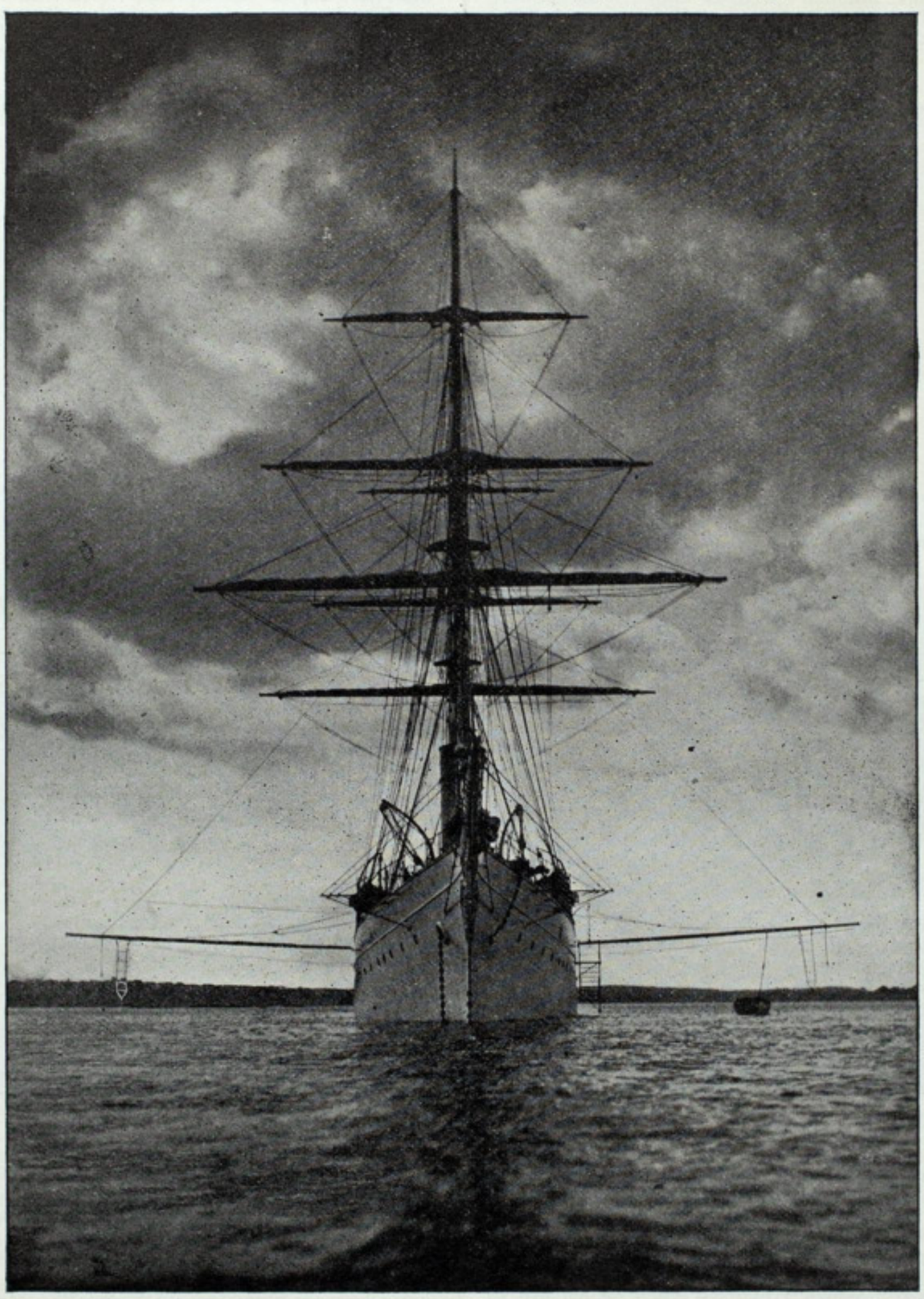
MR. JAMES J. HILL'S YACHT.

If President James J. Hill of the Great Northern Railroad has purchased the steel steam yacht Eleanor, another very important addition has been made to the yacht fleet of the lakes. The Eleanor was built by the Bath Iron Works Co. of Bath, Me., in 1894, for Mr. Wm. A. Slater of Norwich, Conn. She was afterward sold to Mrs. James W. Martinez-Cardeza, and now it is reported that Mr. Hill has purchased the vessel from Mrs. Cardeza. The Eleanor is 243 feet over all, 208 feet on the water line, 32 feet beam, 18 feet 8 inches depth and 13 feet 4 inches draught. Her displacement is 1,138 tons and gross tonnage 804. Engines are triple expansion. The yacht is bark rigged and has a total sail area of 14,036 feet. She carries a crew of fifty-three.

The Eleanor is said to have left Tebo's basin, South Brooklyn, for the lakes. According to the desire of Mrs. Cardeza it is said that the yacht's name is to be changed to Wacouta. The deck house and interior plan of this yacht give an abundance of living rooms, and throughout the furnishings are most luxurious. Among the conveniences aboard are refrigerating and distilling machines and a complete electric plant.



STEAM YACHT ELEANOR—SAID TO HAVE BEEN PURCHASED BY JAMES J. HILL.

AMERICAN BRIDGE COMPANY.

With an annual capacity of 600,000 tons of bridge and structural work the American Bridge Co., recently organized is certainly a very large institution. An official circular, just issued, gives full details of the new company. Its scope will be the designing, building and erection of bridges and all classes of metallic structures. The company announces at the outset that facilities at its disposal are such as to offer the advantage of very favorable quotations and at the same time be enabled to avoid delays in delivery, which in the past have proved so vexatious in many instances. The bridge companies forming the consolidation are: American Bridge Works, Chicago; Berlin Iron Bridge Co., East Berlin, Conn.; Buffalo Bridge & Iron Works, Buffalo; Carnegie Steel Co. (Keystone plant), Pittsburg; Edge Moor Bridge Works, Wilmington, Del.; Elmira Bridge Co., Elmira, N. Y.; Gillette-Herzog Mfg. Co., Minneapolis; Groton Bridge & Mfg. Co., Groton, N. Y.; Hilton Bridge Construction Co., Albany, N. Y.; Horseheads Bridge Co., Horseheads, N. Y.; Lafayette Bridge Co., Lafayette, Ind.; Lassig Bridge & Iron Works, Chicago; New Jersey Steel & Iron Co., Trenton, N. J.; New Columbus Bridge Co., Columbus, O.; Pittsburg Bridge Co., Pittsburg; A. & P. Roberts Co. (Pencoyd Iron Works), Pencoyd, Pa; Post & McCord, Brooklyn, N. Y.; Rochester Bridge & Iron Works, Rochester, N. Y.; Schultz Bridge & Iron Works, Pittsburg; Shiffler Bridge & Iron Co., Pittsburg; Union Bridge Co., Athens, Pa.; Milwaukee Bridge Co., Milwaukee, Wis.; Wrought Iron Bridge Co., Canton, O.; Youngstown Bridge Co., Youngstown, O.

This list contains practically all the leading companies that manufacture bridge and structural work in this country. The Pencoyd plant of the A. & P. Roberts Co. also comprises one of the best and most complete rolling mills for structural material in existence, with a capacity of 200,000 tons per annum. Directing attention to these facilities, the new company announces that its policy will be "all classes of bridge and structural work at an absolute minimum of cost and in the very shortest possible time; no advance in prices but cost of production reduced to a minimum."

Directors of the company are as follows: Percival Roberts, Jr., A. & P. Roberts Co. (Pencoyd Iron Works) Pencoyd, Pa.; Alfred C. Case, Carnegie Steel Co., Pittsburg; William H. McCord, Post & McCord, Brooklyn, N. Y.; Charles M. Jarvis, Berlin Iron Bridge Co., East Berlin, Conn.; William H. Connell, Edge Moor Bridge Works, Wilmington, Del.; Walter Hawxhurst, Elmira Bridge Co., Elmira, N. Y.; Charles Macdonald, Union Bridge Co., Athens, Pa.; Frank Conger, Groton Bridge Co., Groton, N. Y.; James P. Kennedy, Youngstown Bridge Co., Youngstown, O.; Lewis S. Gillette, Gillette-Herzog Mfg. Co., Minneapolis; John F. Alden, Rochester Bridge & Iron Works, Rochester, N. Y.; Walter G. Oakman, Guarantee Trust Co., New York; J. P. Ord, General Electric Co., Schenectady, N. Y.; Robert Winsor, Kidder, Peabody & Co., Boston; Robert Bacon and Charles Steele, J. P. Morgan & Co., New York; Paul E. De Fere, 40 Wall street, New York; Robert S. Green, 1 Montgomery street, Jersey City, N. J.; J. W. Walker, Shiffler Bridge Co., Pittsburg; Abram S. Hewitt, Cooper, Hewitt & Co., New York; August Belmont, August Belmont & Co., New York. The majority of this board are practical bridge men who have in years past made a success of their individual companies. The financial end is unusually strong, being represented by firms and institutions of world-wide financial strength.

The executive organization is made up entirely of men of large practical experience, headed by Percival Roberts, Jr., one of the leading rolling mill managers of the country. The Pencoyd plant of the A. & P. Roberts Co., comprising a rolling mill with a capacity of 200,000 tons per annum and the most complete bridge and structural plant in the world, has all been developed under his personal supervision. Joshua A. Hatfield has been appointed as assistant to the president and will also have charge of the sales of the rolling mill products of the Pencoyd works, a position which his long connection with the sales department of the rolling mill interests of the country makes him especially adapted.

The engineering department is in charge of Mr. Charles C. Schneider (formerly chief engineer of the Pencoyd Iron Works), with the title of vice-president in charge of engineering. Mr. Schneider has full charge of all questions of engineering, including the preparation of all plans, estimates and working drawings. All engineers of the company whether engaged in the contracting, operating or erecting departments, are under the vice-president in charge of engineering. At different localities throughout the country are stationed a corps of designing engineers to prepare preliminary plans and estimates, and at each plant will be located a full and complete corps of engineers and draughtsmen to prepare plans for the work fabricated at that particular plant.

The operating department is in charge of Mr. Charles M. Jarvis, formerly president of the Berlin Iron Bridge Co., with the title of vice-president in charge of operating. As soon as contracts for any work are taken, they are immediately turned over to this department for execution, and consequently all the plants and erecting forces of the company belong in this department. At each plant is a manager, with full

(Continued on page 24.)

RUSSIAN CRUISER VARIAG.

The recent builders' trial trip of the Russian cruiser Variag, built by Cramps of Philadelphia, was in every way satisfactory. Naval experts consider her a distinct advance in warship possibilities. On the preliminary trial trip she made 22 knots an hour, under three-fourths of her horse power, and that, too, in shallow water, so that no fears are entertained of her ability on final trial to steam 24 knots an hour. The Variag has thirty Niclausse boilers and ninety furnace doors grouped in five fire rooms. Her grate surface is 1,575 feet and heating surface 622,290 square feet, and the four smokestacks rise 90 feet above the grate bars. The steam pressure is 250 pounds and the volume of water carried in the boilers at the steaming level is 3,931 feet. Her splendid engines are of the triple expansion type. They were designed by Capt. N. T. Towne, late chief engineer of the United States navy, and have four cylinders balanced on the shaft. The high pressure is 40 inches in diameter, the intermediate 62 inches and each of the low pressure cylinders are 68 inches; the length of the stroke is 36 inches and the intended number of revolutions 160 per minute. On the recent trial the engines worked up to 150 revolutions per minute and developed 17,000 horse power without any vibration whatever.

The length of the vessel is 400 feet; beam, 52 feet; draught, 19 feet 6 inches; displacement, 6,500 tons; nominal speed, 23 knots; horse power, 20,000; radius of action at full speed, 1,000 knots; at 10 knot speed, 3,000 knots; when all bunkers are full (1,290 tons) and at top speed, 1,700 knots; normal coal supply, 770 tons; weight of guns, 440 tons. The only armor protection of the hull is a curved turtle-back deck extending fore-and-aft. Additional protection is given by coal and by cellulose filled into cofferdams. The conning tower is 6 inches thick and the smoke stacks, engine room, hatches and ammunition hoists are well protected. Her battery consists of twelve 6-inch rapid-fire rifles, 45 calibres in length; twelve 3-inch rapid-fire guns, 50 calibres in length; six 1⅛-inch barrel Hotchkiss, two Baranowsky and two 1¼-inch Hotchkiss guns, which are so disposed as to give an exceedingly powerful all-round fire.

BATTLESHIP BIDS.

The navy department issued on Saturday last its circular calling for bids for the battleships Pennsylvania, Georgia and New Jersey, authorized by the act of March 3, 1899, and the battleships Virginia and Rhode Island, authorized by the act of June 7, 1900. The three first named are to have superimposed turrets and the others ordinary turrets. The call for bids will be advertised for sixty days from Sept. 1 and the general plans may be examined at the navy department from Sept. 15. The plans are to be supplied to the prospective bidders on application on Oct. 15 and the bids will be opened on Nov. 15.

The Leyland line steamer Devonian, a sister ship of the Winifredian, was launched at Belfast on June 28. The Winifredian is 552 feet 6 inches long, 59 feet 3 inches wide and 28 feet 9 inches deep. She is of 10,405 gross tons and 6,816 net tons.

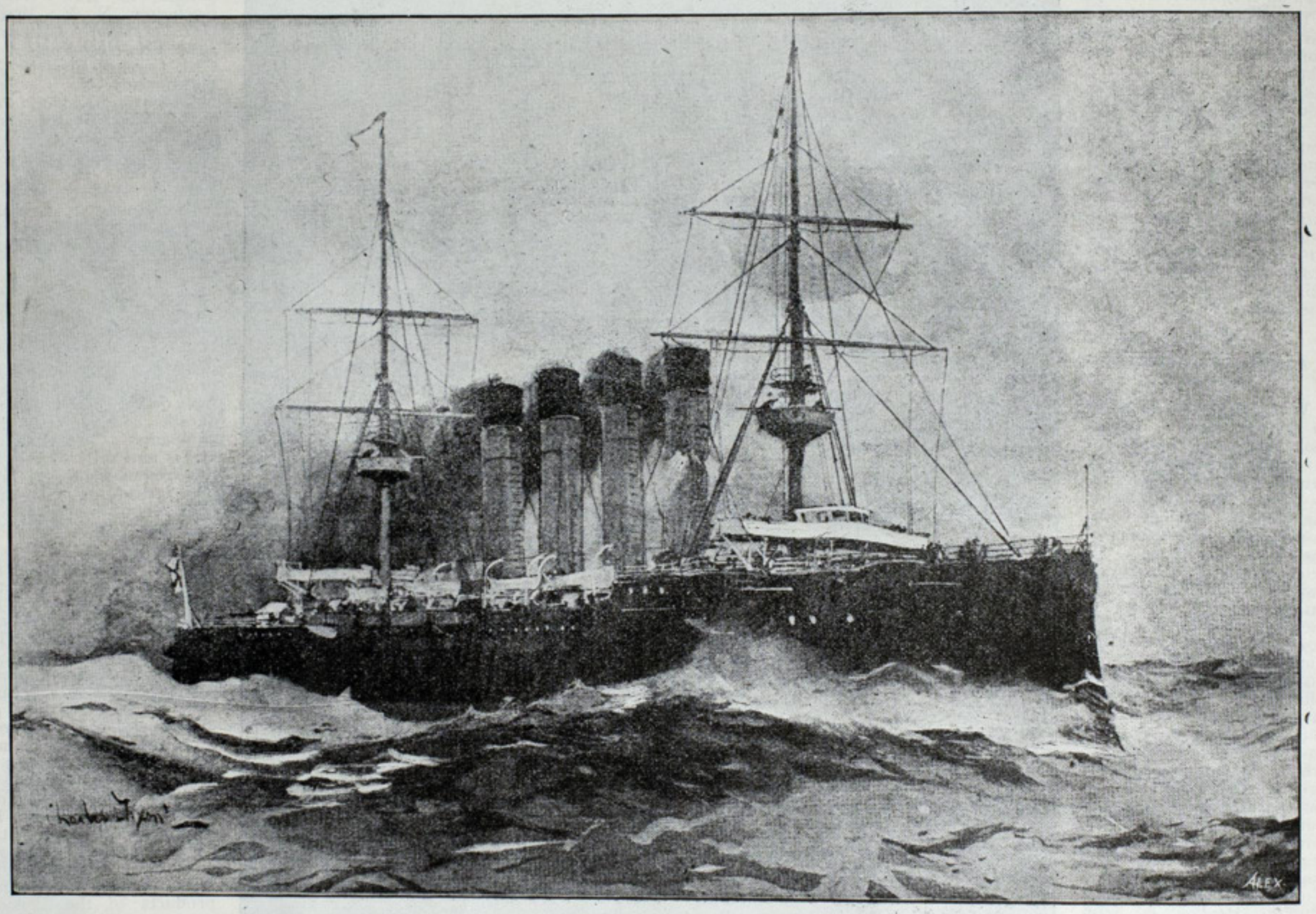
BETHLEHEM STEEL CO.'S ANNUAL REPORT.

The annual report of the Bethlehem Steel Co. shows a net income for the year ending April 30, 1900, of $2,122,000, an increase of $977,000 over the earnings of the Bethlehem Iron Co. during the previous year. The company furthermore out of gross earnings spent $595,000 for improvements and paid off $1,000,000 floating debt. The operations for the year compared with the earnings of the Bethlehem Iron Co. for the year preceding are as follows:

	Bethlehem Steel Co. 1900.	Bethlehem Iron Co. 1899.	Increase.
Net income	$2,122,000	$1,145,000	$977,000
Dividend, 6 per cent., Bethlehem Iron Co.	450,000	450,000	.....
Surplus	$1,672,000	$ 695,000	$997,000

A dividend of $600,000 was declared by the Bethlehem Steel Co., and the profit and loss account shows a surplus of $3,463,351 as compared with $3,320,086 in 1899. The Bethlehem Steel Co. was incorporated in April, 1899, with a capital stock of $15,000,000 in shares of a par value of $50 each. The company leased the Bethlehem Iron Co. at 6 per cent. on the $7,500,000 capital stock of that corporation.

The announcement is made that the company proposes to bid for the entire contract for 36,000 tons of armor plate required by the navy department for the new battleships and cruisers.



RUSSIAN CRUISER VARIAG.

PLANS OF THE THREE PROTECTED CRUISERS.

Having disposed of the plans for the five battleships and three armored cruisers, authorized by the last two naval appropriation acts, the naval board of construction has begun the consideration of the three protected cruisers, also authorized in the last act. The discussion shows that the purpose is to have these ships of a type representing a compromise between the New York and Brooklyn. Objection is made to the peculiar sides of the Brooklyn, but her additional tonnage gives her an advantage over the New York in that respect, so the board is inclined to an enlarged New York of about the 9,000 tons displacement of the Brooklyn. The ships will be furnished with four 8-inch guns, each in shields, and six 6-inch broadside guns probably, and are to have high speed, possibly as high as the 23 knots of the Russian cruiser Variag. The department will have the advertisements ready to submit by Sept. 1, the bids to be opened Nov. 1.

The United States army 18-inch gun, which the Bethlehem Steel Co. of South Bethlehem, Pa., is manufacturing for the war department, to be used in firing the Gathman torpedo, is nearing completion. It will weigh, without its carriage, 59.6 tons, and will be proved by firing ten rounds of solid shot, each weighing 2,000 pounds and each requiring 450 pounds of powder to secure the necessary velocity. This test will be extremely interesting, and will take place some time in July at the Bethlehem company's proving grounds, which are located at Redington, Pa.

FINAL TRIAL TRIP OF THE KENTUCKY.

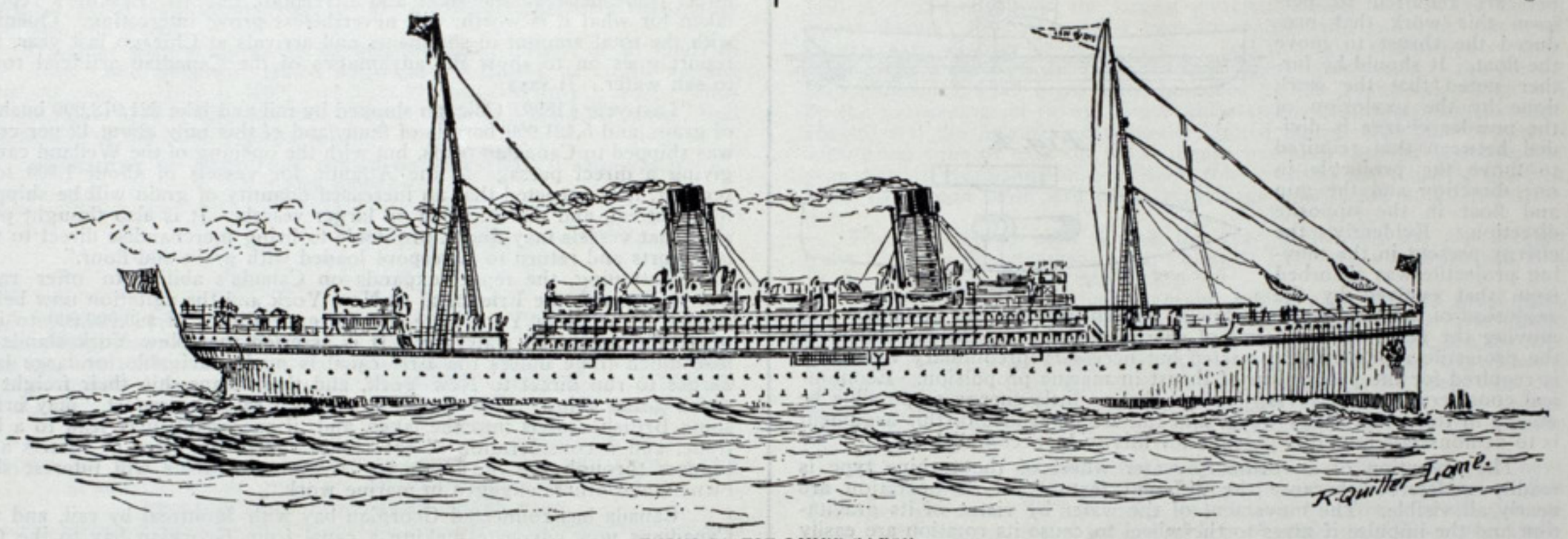
The final trial trip of the United States battleship Kentucky, Capt. Colby M. Chester commanding, was held last week. The board of inspection consisted of Rear Admiral Frederick Rodgers, Commanders J. N. Hemphill and Charles R. Roelker, Naval Constructor W. L. Capps, Lieutenant Commanders Charles E. Vreeland and Richard Henderson and Lieut. Joseph Straus. First the Kentucky was sent along under natural draft for six hours at a speed averaging about 14 knots, not particularly for the purpose of testing the speed but for a structural test. On the second day the supreme test was given, which was most interesting from nearly every point of view. "General quarters" was sounded and every gun on board discharged at least twice, from the big 13-inch and 8-inch guns in the double turrets down to the 1-pounders on the rail and the Colts and Maxims in the fighting tops. The first shots were fired with the guns at level, and the second shots at the extreme elevation in nearly every case so as to exert all the strain possible.

The big guns in the two turrets have an extreme elevation of 15 degrees but they were pointed up to 13 degrees only on the second shots. The four guns in the after turret were fired simultaneously; the discharge and subsequent concussion were described as being more terrific than anything of the sort they had experienced before. One of the officers said he didn't believe man was calculated to endure such things, as the concussion was so great that it seemed to shake every part of his body and leave him trembling like a leaf. In the recent test of the Kearsarge's battery it was said that the vibration of the machine guns in the tops was too great for accuracy in aim. Such, however, was not the case with the machine guns of the Kentucky. The only difficulty was a slight jamming of the Colts.

The report is now being reduced to figures to present to the navy department.

UNION-CASTLE LINER SAXON.

The latest and largest addition to the Union-Castle line of steamships, from Southampton to the Cape, is the Saxon, which started on her first voyage to the Cape on June 16. She is the first of the late Union liners to have the Castle colored funnels—red and black tops—and she looks fine with these and her snow white hull. She is 570 feet long, 64 feet beam and 12,970 tons displacement. She carries in all about 1,200 passengers, her crew numbering 250.



UNION-CASTLE LINER SAXON.

ACTIVITY IN GERMAN SHIP YARDS.

There are thirty-nine ship yards in Germany, employing altogether nearly 50,000 men, and together they constructed last year, 1899, 528 vessels of all kinds for the navy, the merchant marine, and for river traffic of the larger description. Of these yards five are used for the construction of naval vessels, having an aggregate capacity for the simultaneous construction of over forty of the largest ships, twenty-eight torpedo boat destroyers and thirty torpedo boats. Just now the different yards in Stettin alone are constructing thirty large vessels, including the Deutschland (completed), 16,000 tons; a fast steamer for the North German Lloyd, 14,800; and three other passenger steamers of 11,000 tons each. The official statistics show that the German ports were visited during the past year by 140,000 vessels, whose combined tonnage was 30,000,000. On Sept. 30 last, Great Britain had 1,347,000 tons of commercial ships in construction, against Germany's 199,000 tons.

NORWEGIAN ARMORCLAD EIDSVOLD.

The Norwegian armorclad Eidsvold, a coast defense ship of 3,850 tons displacement was launched from the Elswick ship yard of the Armstrongs in England recently. She is a sister ship of the Norge, built by the same firm, and with her forms the most powerful units of the Norwegian navy. She is 290 feet long, 50 feet broad and has a draught of 16 feet 6 inches. She will carry two 8-inch guns in shielded barbettes of 6-inch nickel steel; six 6-inch guns, four in casements of 5-inch nickel steel at the corners of the battery, and one on each broadside in the center, protected by shields; eight 12-pounders, six 3-pounders and two submerged torpedo tubes. She has an armored belt of 6-inch Harveyized steel extending between the barbettes, and a 2-inch armored deck, all fore-and-aft. Two sets of vertical triple expansion engines, developing 4,500 indicated horse power, are to propel her at a maximum speed of 16½ knots. Steam will be supplied by Yarrow boilers.

Rear Admiral Remey with his flagship, the Brooklyn, has been sent to Taku to assume active command of the American fleet at that point.

NEW ARMOR PLATE PROCESS.

Patent litigation over the nickel steel armor plate process, rather than any purpose to bid for government contracts soon to be let by Secretary Long, may be the explanation of the secrecy surrounding the chartering of the American Nickel Steel Co. in Delaware last week. Col. B. K. Jamison of Philadelphia, brother of John C. Jamison, president of the Damascus Steel Co. of Pittsburg, is the American representative of the British syndicate which makes some claims on the nickel steel processes. Col. Jamison says of the situation:

"These patents are used by the Carnegie company and the Bethlehem Steel Co., and perhaps others. One originally belonged to Henry Snyder of Le Creusot, France, and the other to the Ferro-Nickel company of Paris, of which Henry Marbeau is president. The patents were granted in this country in 1890. A few years later they were purchased by the Nickel Steel syndicate of London, which has transferred them to the company which I represent. The Carnegie company has been using the patents several years, and has paid no royalties on them, a suit having been entered in the United States circuit court for several years' infringement of them. The Bethlehem Steel Co. has paid all its royalties, but we are not sure that others are not infringing upon it. That's what we propose to find out. With the increasing demand for nickel steel we expect, under careful protection of our patents, to reap magnificent royalties. They should yield annual royalties of $500,000. All the ships in our navy use nickel steel plate. The government has endorsed it and so has the British admiralty, and it is becoming so popular that it may soon be used for building purposes. At present, shafting, bolts, railroad axles and piston rods are being made from it, and the Pennsylvania Railroad Co. is experimenting with a view of installing it for rail purposes."

The suit for infringement in the United States circuit court was instituted by the Nickel Steel syndicate against the United States government. So far as the probability of the new owners of the patents bringing action against the Carnegie company is concerned, officials of the big steel company will make no comment. In answer to some questions, President C. M. Schwab briefly said: "We consider our nickel-plate steel processes no infringement at all."—American Manufacturer, Pittsburg.

DELAWARE FORGE & STEEL CO.

The Delaware Forge & Steel Co., recently incorporated with a capitalization of $5,000,000, has the largest capital of any bona fide company doing business in the state of Delaware under the new incorporation laws. The incorporators are J. C. Osgood of New York; John Fritz of Bethlehem, Pa., well known through his former connection with the Bethlehem Steel Co.; H. S. Swyth of Bethlehem, a well-known capitalist; John Stambaugh, Jr., an iron manufacturer and capitalist of Pittsburg; Seward Babbitt of Pittsburg, who is connected with the Tod Engine Co. of Youngstown, O.; Walter M. Gorman of Philadelphia, a director of the Diamond State Steel Co.; Howard T. Wallace of Wilmington, Del., president of the Diamond State Steel Co.; William Lawton, president of the Wilmington board of trade, and J. Ernest Smith, an attorney. Officers of the new concern are: President, John Fritz; vice-president, Seward Babbitt; secretary and treasurer, Howard T. Wallace.

It is understood that a considerable number of large capitalists of New York and the middle west will be interested in the company. They will make heavy forgings, and under the powers of their charter may largely extend the branches of their business in any line consistent therewith, and it is expected that several thousand men will be employed by them when in full operation. The company will shortly begin the erection of buildings on their 200-acre tract at Wilmington. The forge alone will occupy 400 by 1,600 feet and will necessitate the expenditure of $500,000. Besides this there will be a large machine shop of about the same size as the forge building. One line of business in particular which the company will prepare to handle will be the making of shafts for vessels.

HAVANA DRY DOCK TO BE EXAMINED.

The navy department will shortly detail a board of officers, composed of Lieut. Com. Lucien Young, Chief Engineer C. R. Roelker and Civil Engineer A. G. Cunningham, to examine the floating steel dry dock at Havana, the property of the Spanish government. The examination is deemed necessary to determine the value of the structure, which has not been moved since it was taken to Havana. The board will not proceed to Havana until authority is secured from Madrid that the inquiry may be made. The future location of the dock is a matter to be decided. The chances are that it will be taken to San Juan or some other naval station in Porto Rico. The commandant of the Pensacola station has submitted a strong plea, however, for sending the Havana dock to that place.

IMPROVEMENTS IN SCREW PROPULSION.

BY I. McKIM CHASE.

When advocating improvements in screw propulsion in a direction which has been little explored, doubt has sometimes been expressed as to the possibility of utilizing water that has once been acted on by a screw propeller to further aid in producing thrust. It is urged that after being once acted on the usefulness of the water for producing thrust is exhausted so far as the vessel to which the screw is applied is concerned. Such opinions result from a failure to fully comprehend the principles involved in marine propulsion. At the risk of being thought prolix I will endeavor to make the principles of marine propulsion plain to any ordinary person and elucidate at least one way by which the water discharged by a primary propeller can be further made to produce thrust.

A gun is such a familiar instrument and its behavior when fired so widely understood that it will make a good medium by which this may be done. Fig. 1 represents a gun secured to a float. Should the gun be fired the recoil resulting from the discharge of the projectile and powder will tend to move the float in a direction opposite to that of the discharge. This movement will be increased as the weight of the projectile and powder increases or diminishes as that of the gun and float is diminished. It will be observed in this case that there is present a condition which obtains in every case of marine propulsion, namely, that it was necessary first to perform certain work, and that it was the reaction of the pressure required to perform this work that produced the thrust to move the float. It should be further noted that the work done by the explosion of the powder charge is divided between that required to move the projectile in one direction and the gun and float in the opposite direction. Evidently the energy present in the moving projectile was absorbed from that evolved by the explosion of the powder, and while so present it could not be engaged in moving the float. The amount of energy absorbed in the movement of the projectile represents the wasted but necessary preliminary work that is required for the production of thrust in marine propulsion. Economical considerations, however, demand that as little energy as possible be wasted in this preliminary work, and the chief purpose of this argument is to demonstrate how it is possible for this to be accomplished.

Fig. 1.

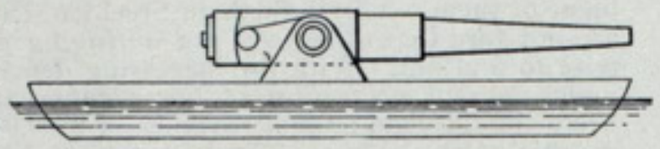


Fig. 2.

Fig. 3.

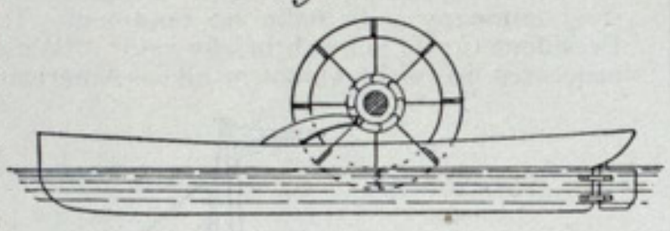
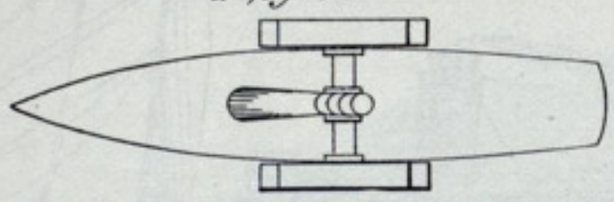


Fig. 4.



The operation of an ordinary water wheel of the turbine type is readily understood because the different features of its operation are nearly all visible. The movement of the water by virtue of its gravitation and the impulse it gives to the wheel to cause its rotation are easily comprehended. When the water passes away from a turbine after performing work it possesses less motion than when it entered the wheel, the amount depending on the work performed during its action upon the wheel. In the case of screw propulsion the operation is the reverse of that of the turbine. The ultimate object sought is the driving of the ship, and in order to accomplish this it is necessary to produce an end pressure or thrust on the shaft. The screw is made to discharge a quantity of water, and the reaction of this produces the thrust. In this case, eliminating the following wake which prevails with all advancing vessels to a greater or less extent, the water is at rest. The screw being made to rotate by the engine causes a movement of the water which is in contact with it, and this movement is accelerated while the water is being acted on until it is discharged by the screw. In many instances the water so discharged has considerable velocity. It is evident that such water is just as capable of performing useful work as that which is given motion by gravitation. When a screw propeller is driving a ship the power absorbed in doing so is divided between that required to move the ship and that to move the quantity of water in the opposite direction necessary to produce the thrust.

Another factor which enters largely into the problem of screw propulsion is the inertia of the water acted on or the resistance it opposes to being put in motion by the screw. But the chief factor is the reactionary effect of the water discharged by the screw, and it is the main purpose of this argument to demonstrate how this discharged water, which has once served its purpose, may be further utilized to aid in propelling the ship. The same principle obtains with all systems of marine propulsion, whether it be by paddle, screw, or jet. The latter is here selected as presenting the simplest form for illustrating the method by which the discharged water from the propelling instrument may be employed to assist propulsion.

Fig. 2 represents a boat provided with a nozzle. If a stream of water is discharged from the nozzle the reaction resulting therefrom will move the boat in an opposite direction to that of the discharge. It makes but little difference in the reactionary effect whether the discharge occurs below or above the surface of the water. The reactionary effect occurs while the fluid is moving in the pipe and ceases entirely after the water has moved from the nozzle a distance equal to about one-fourth of the diameter of the orifice. While the water discharged will cease to have any reactionary effect as above stated, it will continue to move and it is possible for it to have considerable energy impressed upon it.

In the hydraulic system of mining as practiced in California streams of water are made to issue from nozzles with tremendous velocity. In some instances a stream will carry an enormous amount of energy, and be so dense and rigid that a reliable authority has stated that an ax could not be driven through it. The face of the country in some districts has been entirely changed by these streams.

Fig. 3 illustrates the jet boat, modified by having added to it a pair of paddle wheels with an impact or Pelton wheel geared to the paddle shaft. Thus arranged the cups of the wheel receive the impact of the stream of water after it ceases to have any reactionary effect on the nozzle. The action of the stream will cause the rotation of the paddle-wheels with the result that the propulsion of the boat will thereby be increased over that it receives from the jet alone.

The Pelton wheel in combination with the jet serves the purpose that guide blades would if connected with a screw propeller. The method which promises the greatest success in utilizing the discharged water from a screw propeller to aid propulsion is by the use of guide blades in combination with the screw. The conditions which generally surround the application of screw propellers makes the combination of guide blades with the screw somewhat more difficult than the above arrangement with the jet, but success has been achieved with problems much more difficult.

CANADA'S CANALS.

THE BRITISH VICE-CONSUL AT CHICAGO PREPARES A REPORT ON THE POSSIBILITIES OF DIRECT TRADE BETWEEN THE LAKES AND LIVERPOOL.

Reports on commercial subjects from our own consuls in distant countries are sometimes hurriedly prepared and not always reliable as to detail. The same may be said of a report prepared by Thomas Erskine, British vice-consul at Chicago, on the subject of direct trade between lake cities and England as a result of the opening of Canada's St. Lawrence canals. Of course Mr. Erskine lays particular stress on the chances of trade for British ships from Chicago (flour, grain, provisions, etc.), but he also refers to all the large ports on the lakes. The practical vessel owner of the lakes sees much to criticize in all the discussion relative to direct trade between the lakes and Liverpool, but Mr. Erskine's report, taken for what it is worth, will nevertheless prove interesting. Opening with the total amount of shipments and arrivals at Chicago last year, the report goes on to show the advantages of the Canadian artificial route to salt water. It says:

"Last year (1899) Chicago shipped by rail and lake 221,972,000 bushels of grain, and 5,421,000 barrels of flour, and of this only about 12 per cent. was shipped to Canadian ports, but with the opening of the Welland canal, giving a direct passage to the Atlantic for vessels of about 1,500 tons register, it is expected that an increased quantity of grain will be shipped to Montreal, and there loaded on larger vessels. It is also thought possible that vessels may find it profitable to bring merchandise direct to the lake ports and return to Liverpool loaded with grain and flour."

Continuing, the report expands on Canada's ability to offer rates competing with the Erie canal to New York and the agitation now being carried on in New York state for the expenditure of $60,000,000 to improve the American waterway. It is asserted that New York stands to lose much trade unless the Erie canal is made navigable for large lake barges to run direct to New York, and there trans-ship their freight to ocean-going ships. "The Canadian canals," says the report, "may bring some British vessels into the lakes, and, if successful, may lead to a big trade, and a consideration of the conditions of the class of vessels able to pass through the St. Lawrence river and canals will interest ship owners and others engaged in marine work.

"Canada has connected Georgian bay with Montreal by rail, and the Canadians now advocate making a canal from Georgian bay to the Ottawa river, giving a direct waterway which, while shortening the distance from Chicago and Duluth to Montreal by about 400 miles, would save the expenses of the Welland and other canals and the difficulties of the upper St. Lawrence. The only drawback to the Welland canal, which it is hoped will not be found in the Georgian bay canal, if it is constructed, is that it was not planned on a broader scale as to dimensions, as the modern freighter can deliver to the railroads and Erie canal three times as much grain as can be carried by a vessel of the St. Lawrence and canal tonnage.

"The trade opened by the Canadian canals, to which the attention of British ship owners is called, is for vessels which will pass through the canal locks, which are of the following dimensions: Length, 270 feet; width, 45 feet, and 14 feet depth, and which will trade either direct with ports in the United Kingdom or carry their freight to Montreal and there transfer it to ocean steamers, and the extent of this trade will depend upon whether, with economy in coal, etc., British vessels can compete with the large freighters which carry the grain for the railroads to New York. That British shipping does not have its proper share of this trade is shown by the fact that while there were 161 vessels entered at Chicago and South Chicago in 1899 from Canada, only twelve of these were British, the rest being American. The distance from New York to Liverpool is 3,053 miles, while from Quebec it is only 2,600 miles, and the distance from Quebec to Chicago, the furthest port on the lakes, is 1,400 miles. The direct imports to Chicago in 1899 were valued at 2,824,282 pounds, and of this amount Great Britain is credited with 653,546 pounds, nearly all of which must have come by Atlantic ports of the United States, and then by rail, or from American ports on the lakes, and, of course, does not take into account importations cleared at the New York custom house and then sent on to Chicago."

The pith of the matter is said by Mr. Erskine to lie with the British vessels drawing 14 feet of water in the canals being able to compete with the large American freighters and the railways by bringing merchandise from the United Kingdom direct to Chicago and other lake ports, and returning with grain. The following are stated as the conditions under which the ocean ships would travel during the lake end of their trips: A vessel could carry enough cargo to Montreal to enable her to pass through the canals and there load down to her seagoing water line, and in this way vessels of greater draught but of the proper length and breadth could be used in the trade; it would be necessary to have a pilot on board from Quebec whose remuneration would not exceed $5 per day; the question of extra insurance rates on account of the more northerly latitude at which the vessels would cross the Atlantic and because of their being navigated on an inland sea would also require adjustment, although the

lakes are admirably lighted and buoyed; vessels would have to coal at their lake port.

In the ship building trade on the lakes a chance is seen for the extension of British trade as applied to Canada. This section of the report concludes as follows: "That the ship building in the lakes is at present only beginning is apparent, and, with means of getting to the seaboard, it should advance rapidly, but, at the same time, the lake trade is also increasing, and there should certainly be an opening for British capital both in building and owning lake vessels."

Vice-Consul Erskine in an interview said that English ship owners are all turning their attention to the lake and ocean trade. He added that in the near future British vessels would undoubtedly be coming into Chicago with cargoes and carrying grain and other food products for Liverpool. "We pay for the foodstuffs," said Mr. Erskine, "and it is only natural we should reach out after the carrying trade. The opening of the Canadian canals has given us a chance to get to the lakes and we are going to make the most of our opportunities. Several vessels have been constructed in England this year for service on the lakes between American ports on Lake Superior and Canadian points. These ships will be something similar to those contemplated for the lake and ocean routes from Chicago. They are of about 1,500 registered tons and built especially for the canal trade. English vessel owners are constantly calling for information on the chances of the Chicago-Liverpool trade, and the report just published by the British government is probably only a forerunner of more extensive ones to follow. Chicago is a great port, and it begins to look as if it will soon be a terminus for an ocean-going fleet. At any rate the English shipping men are taking steps in this direction."

ENORMOUS MOVEMENT OF FREIGHT.

Another half-million increase in iron ore shipments on the great lakes will be recorded for the month of June, which, added to an increase of a million tons during April and May, will make a total gain over 1899 of 1,500,000 tons to July 1. Reports from two shipping docks were lacking when these figures were made up, but it is quite certain that when these are heard from the increase to July 1 will be rather over than under a million and a half.

A similar gain is shown in the movement of freight of all kinds to and from Lake Superior, which aggregates 8,673,481 net tons, against 6,409,086 tons on July 1, 1899, and 5,321,812 tons on July 1, 1898. Thus the gain over 1899 is 2,264,395 tons and over 1898 it is 3,351,679 tons. Full summaries of the canal reports follow:

MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

ITEMS.	To July 1, 1900.	To July 1, 1899.	To July 1, 1898.
Coal, anthracite, net tons	229,052	257,319	122,656
Coal, bituminous, net tons	1,422,601	696,227	1,051,328
Iron ore, net tons	5,475,267	3,917,675	3,722,548
Wheat, bushels	19,145,392	13,698,691	7,743,183
Flour, barrels	1,854,894	1,600,361	1,995,530

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO JULY 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.

ITEMS.	Designation.	To July 1, 1900.	To July 1, 1899.	To July 1, 1898.
Copper	Net tons	42,331	26,135	45,544
Grain, other than wheat	Bushels	5,383,774	11,473,996	10,648,127
Building stone	Net tons	6,408	1,273	3,075
Flour	Barrels	1,854,784	1,600,361	1,994,828
Iron ore	Net tons	5,475,267	3,917,675	3,722,548
Iron, pig	Net tons	4,092	8,949	11,586
Lumber	M. ft. b. m.	250,968	254,754	243,160
Silver ore	Net tons	.....	.....	.....
Wheat	Bushels	19,145,392	13,698,691	7,743,183
Unclassified freight	Net tons	15,282	48,201	78,005
Passengers	Number	5,077	3,615	2,658

WEST BOUND.

Coal, anthracite	Net tons	229,052	257,319	122,656
Coal, bituminous	Net tons	1,422,601	696,227	1,051,328
Flour	Barrels	110	.....	702
Grain	Bushels	.....	9,500	4,250
Manufactured iron	Net tons	46,901	38,295	72,668
Salt	Barrels	94,215	133,287	114,117
Unclassified freight	Net tons	135,285	115,326	136,178
Passengers	Number	5,210	4,704	3,823

SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

	To July 1, 1900.	To July 1, 1899.	To July 1, 1898.
East bound freight of all kinds, net tons	6,825,444	5,281,821	4,931,476
West bound freight of all kinds, net tons	1,848,037	1,127,265	1,390,336
	8,673,481	6,409,086	5,321,812

Total number of vessel passages to July 1, 1900, was 6,246 and the registered tonnage 7,562,385.

AMERICAN MERCHANT MARINE.

ADDITIONS TO IT HAVE BEEN GREATER THAN IN ANY YEAR SINCE 1856—ONLY ONE VESSEL ADDED TO THE FOREIGN-TRADE FLEET—LARGE INCREASE ON THE GREAT LAKES—TOTAL DOCUMENTED TONNAGE OF THE UNITED STATES IS ABOUT 5,000,000 GROSS TONS.

Washington, D. C., July 3.—The bureau of navigation states that during the fiscal year ended June 30, 1900, the total tonnage, officially numbered, amounted to 417,034 gross tons. Full returns from Honolulu will not be received for a fortnight, but about 38,000 tons of Hawaiian vessels were entitled to American documents under the act of congress creating the territory of Hawaii. Porto Rican vessels were also by act of congress entitled to American documents, but they aggregate less than 1,000 tons. Complete figures will probably show that the actual additions to the American merchant fleet during the year have surpassed the 437,846 gross tons documented during the fiscal year 1874, when the law required all canal boats in domestic trade to be documented. In that event the additions to our merchant fleet during the past fiscal year will have been greater than during any year since 1856. The figures will be slightly reduced by the fact that the issue of official numbers and of marine documents are not simultaneous.

Vessels built in the United States and officially numbered during the year aggregate 381,863 gross tons. This record was surpassed in 1874 when 432,725 gross tons were built in the United States and documented. Of the new vessels built during the year, 483 of 213,052 gross tons are steam vessels, 575 of 92,625 gross tons are sail vessels, including barges with sail power, and 76,186 tons are barges and a few canal boats for Canadian trade without power of self-propulsion. The large proportion of steam vessels, 56 per cent. of the total, makes this year's addition to the fleet, in value and in carrying power, superior to the additions in 1874, or of any other year in our history.

The most important additions of the year have been the large steel vessels built for the trade of the great lakes. They include the James J. Hill of 6,025 gross tons, the largest merchant vessel built in the United States during 1900; nine other lake steamships and two steel schooner barges, each of over 5,000 gross tons, and five lake steamships of over 4,000 gross tons. On the seaboard the largest vessel built is the steamship California, 5,879 gross tons, launched at San Francisco, which will be the pioneer vessel in opening regular steam communication between Hawaii and the Atlantic ports of the United States. No other vessel of 5,000 gross tons or over on the seaboard has been numbered during the year, but six steamships of over 4,000 tons each for the Atlantic coasting trade have been built, and other very large vessels are under construction.

The only vessel built during the year exclusively for the foreign trade has been the steamship Maracaibo of 1,771 gross tons for the Red D line in the Venezuelan mail trade.

The sister steamships San Juan and Ponce, each of 3,503 gross tons, and the Porto Rico, 1,257 gross tons, giving the island the best means of steam communication with the United States it ever had, are the first maritime results of the annexation of Porto Rico. The steel ship Edward Sewall, 3,206 gross tons, and the steel bark Kaiulani, 1,570 gross tons, for the Hawaiian trade, are the square rigged vessels built, but eleven schooners each of over 1,000 gross tons were constructed for the Atlantic coast trade.

Additions from sources other than construction during the year have been: Repaired wrecks, 9,843 tons; Hawaiian vessels numbered at San Francisco since June 14, 8,631 tons; vessels sold to citizens by the government, 7,326 tons; admitted by special acts of congress, 5,764 tons; American vessels returned from foreign flags, 3,607 tons.

Full returns will probably show that the total documented tonnage of the United States on June 30, 1900, for the first time since 1865, has again reached 5,000,000 gross tons. The tonnage registered for foreign trade, however, will probably be slightly below 848,000 gross tons, the figures for June 30, 1899. The increase of the Alaskan trade, carried on mainly by registered vessels, has checked somewhat during the year the steady decline in American tonnage registered for foreign trade.

Of the 1,058 steam and sail vessels of 305,677 gross tons built and numbered during the year, ninety-eight of 185,434 tons were steel, 957 of 119,355 tons were wood, and three of 888 tons were iron. The proportion of steel construction is thus much the greatest in our history. This result is attributable also to the great lakes construction, where of a total of 99,776 gross tons, 95,015 tons, twenty-five vessels were steel steam vessels. The numbered construction on the Atlantic seaboard comprised 715 vessels of 160,576 tons, of which 76,344 tons were wood. Numbered construction on the Pacific comprised 37,386 gross tons, and on the Mississippi, Ohio and western rivers 131 vessels of 7,939 tons.

For purposes of comparison, vessels under construction in Great Britain on March 31, the latest figures available, were 554, of 1,260,422 gross tons, of which 115 were ocean steel steamships of 4,000 gross tons or over, seventeen being of over 10,000 gross tons. During the three months ended March 31, Great Britain launched 129 steamships of 264,208 gross tons. On that date British vessels under construction were 125,000 tons less than for the corresponding date in 1899.

TANK VESSELS ON THE VOLGA.

Tank vessels employed in carrying naphtha in the Kasan district, from Rybinsk to the mouth of the Volga, with all the tributary rivers except the Oka, were counted last winter, and comprised 1,594 wooden vessels and eighty-two iron vessels, making a total of 1,676. The life of the wooden vessels is reckoned at seventeen to eighteen years. In 1895 the age of them was ascertained, and it was found that 25 per cent. were between one and five years, 26.4 per cent. between five and ten years, 26.7 per cent. between ten and fifteen years, 18.3 per cent. between fifteen and twenty years, and 3 per cent. over twenty years. The maximum life of the iron tank vessels is put at fifty years, the minimum at twenty years, although twelve years are looked upon as the probable life of very shallow and thin vessels. There are no vessels which have seen fifty years' service, the oldest being built in 1863. In the year 1895 the age of the iron vessels was as follows: From one to five years, 42 per cent.; from five to ten years, 19 per cent.; from ten to fifteen years, 23 per cent.; from fifteen to nineteen years, 12 per cent.

NAVY AND MERCHANT MARINE.

OUR VESSELS OF WAR COMMAND THE WORLD'S ATTENTION—THEY HAVE ENTERED THE DOORS OF COMMERCE AND WILL SOON BE FOLLOWED BY SHIPS OF TRADE—RESUME FROM THE BLUE BOOK OF AMERICAN SHIPPING OF THE GREAT PROGRESS OF A YEAR.

Following is the introduction to the 1900 edition of the Blue Book of American Shipping, which is published by the Marine Review Publishing Co., and which is now on the press:

The pride of the American people is centered today in its navy; tomorrow it will be centered in its merchant marine. The navy knocked loudly at the doors of oriental countries; it awakened the indifferent east to the acute realization of its existence; it gave the command for the world's attention. It threw off the modest robe of isolation and put on the brilliant garment of international prowess. It blotted out the past and wrote in the future. No impression could have been more indelible; the blow of a day will last for a thousand years. The American navy opened the doors of the world's commerce; the American merchant marine will keep them open.

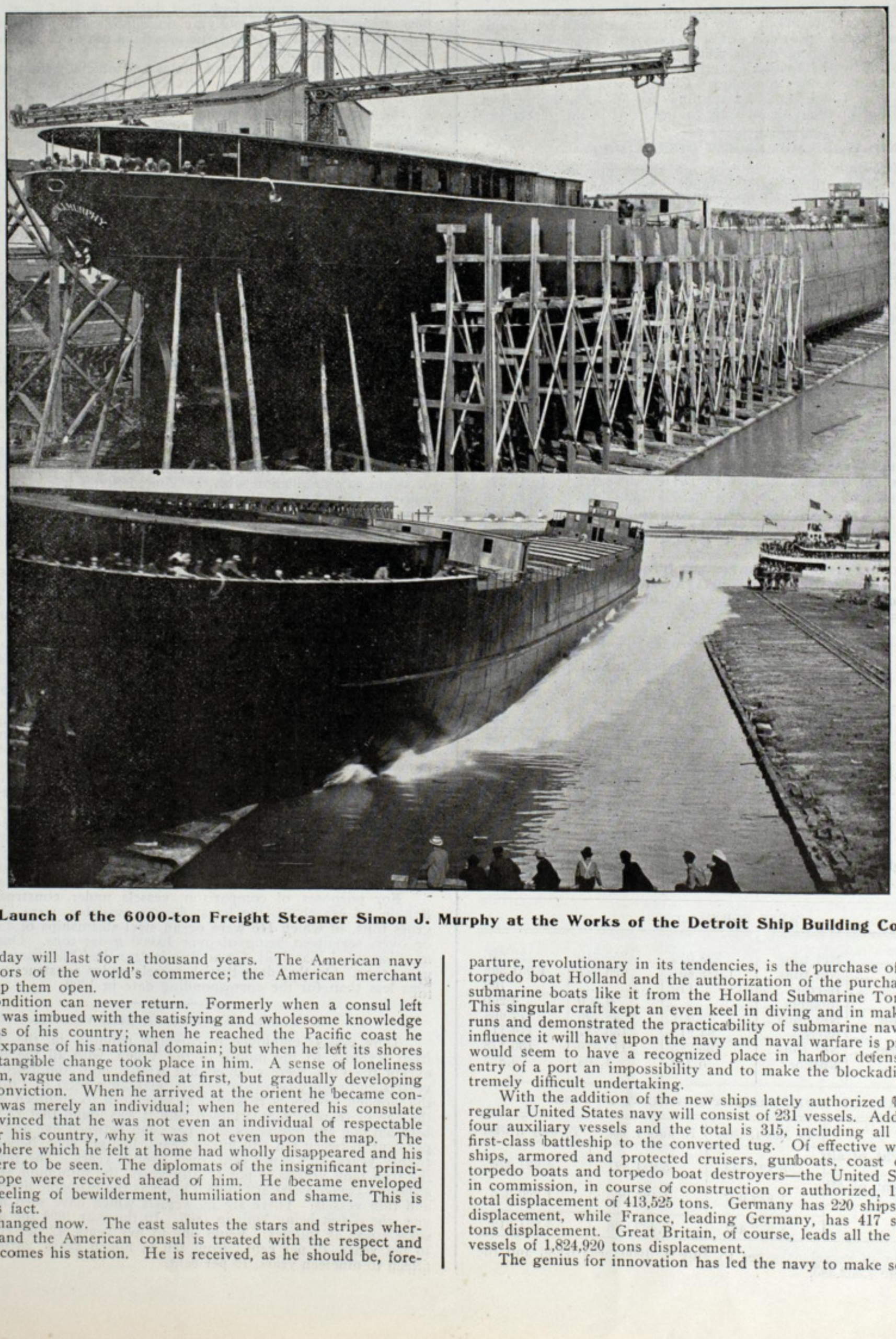
The old condition can never return. Formerly when a consul left Washington he was imbued with the satisfying and wholesome knowledge of the greatness of his country; when he reached the Pacific coast he gloried in the expanse of his national domain; but when he left its shores a subtle and intangible change took place in him. A sense of loneliness seized upon him, vague and undefined at first, but gradually developing into a settled conviction. When he arrived at the orient he became conscious that he was merely an individual; when he entered his consulate he became convinced that he was not even an individual of respectable size, and as for his country, why it was not even upon the map. The national atmosphere which he felt at home had wholly disappeared and his flag was nowhere to be seen. The diplomats of the insignificant principalities of Europe were received ahead of him. He became enveloped in a mingled feeling of bewilderment, humiliation and shame. This is not fancy; it is fact.

But how changed now. The east salutes the stars and stripes wherever it sees it and the American consul is treated with the respect and deference as becomes his station. He is received, as he should be, foremost among the nations of the earth. It is the heritage bestowed upon him by the American navy.

It is gratifying to observe that the present congress at its first session has provided for a substantial increase of the navy. The naval bill provides for the construction of two battleships, three armored cruisers and three protected cruisers. The battleships are to cost approximately, exclusive of armor and armament, $3,000,000, the armored cruisers $4,000,000, and the protected cruisers $1,141,000 each. In addition there are yet to be laid down three battleships and three armored cruisers of the largest class, provided for in the act of March, 1899. The circulars outlining the general plan of these great warships are about to be submitted to the ship builders for proposals of construction. Contracts were awarded last fall for the construction of six protected cruisers, but only two of these have as yet been begun. All of these vessels are exclusive of some forty-three now building for the United States navy in the various coast ship yards. The forty-nine vessels for which contracts have been let aggregate in price, exclusive of armor and armament, $34,554,410. The program not yet contracted for will approximate in cost $40,000,000. The one departure, revolutionary in its tendencies, is the purchase of the submarine torpedo boat Holland and the authorization of the purchase of five more submarine boats like it from the Holland Submarine Torpedo Boat Co. This singular craft kept an even keel in diving and in making submerged runs and demonstrated the practicability of submarine navigation. What influence it will have upon the navy and naval warfare is problematical. It would seem to have a recognized place in harbor defense to make the entry of a port an impossibility and to make the blockading of it an extremely difficult undertaking.

With the addition of the new ships lately authorized by congress the regular United States navy will consist of 231 vessels. Add to this eighty-four auxiliary vessels and the total is 315, including all types from the first-class battleship to the converted tug. Of effective warships—battleships, armored and protected cruisers, gunboats, coast defense vessels, torpedo boats and torpedo boat destroyers—the United States has today in commission, in course of construction or authorized, 122 ships with a total displacement of 413,525 tons. Germany has 220 ships of 410,805 tons displacement, while France, leading Germany, has 417 ships of 765,519 tons displacement. Great Britain, of course, leads all the navies with 506 vessels of 1,824,920 tons displacement.

The genius for innovation has led the navy to make some daring ex-



Launch of the 6000-ton Freight Steamer Simon J. Murphy at the Works of the Detroit Ship Building Co.

periments. Since the last issue of the Blue Book the superimposed batteries of the Kearsarge have been tested and have demonstrated their ability to deliver a fearful concentration of fire without material shock to the ship or interference in the turrets. Structurally they are successful. What element of danger there may be in them during actual conflict is the point upon which experts may well afford to disagree. Would a well-placed shot cripple the turret and put the guns out of action? If so, what are the chances of such a shot? Does it compensate for the added arc and angle of fire? It is clear that if the chance is imminent a single turret is better than a double one, for with only a single turret out of action the ship has still a considerable battery left.

The experiment of coaling the battleship Massachusetts from the collier Marcellus at sea was successful. The battleship was coaled while towing the collier at a rate of eight miles an hour, the coal being carried in 800-pound bags along a cable from the collier to the battleship. The experiments in wireless telegraphy demonstrated the feasibility of communication from ship to ship, the range of intelligible messages depending upon the height of the sprit upon the masthead. The elimination of interference when more than one message is sent is yet to be accomplished. It is possible for an enemy within the range of communication by also sending messages to entirely confuse the receiver. However, imperfect as it is, wireless telegraphy has a distinct field of usefulness.

Immense strides have been made in the application of electric driving power for auxiliary machinery. The cautious experiment of electrically-driven turret-turning machinery on the Brooklyn, of chain ammunition hoists on the Puritan, the system of blowers and exhausters on the Wilmington have all been grouped on the Kearsarge and Kentucky. These two battleships have more of their auxiliary machinery driven by electric power than any other warships afloat. Indeed the only limitation for its employment to all auxiliary machinery is the time necessary to train the men to care for the electric plants. The battleships Kearsarge and Kentucky are lighted under peace and battle conditions by electricity; four search lights are operated; the Ardois signal set is operated for night signaling and also various means of interior communication within the ship, such as battle and range order indicators, electric propelling and steering engine telegraphs, revolution and helm angle indicators; truck lights and the ship's running lights are operated and also the portable diving lantern; the two turrets, containing the 8-inch and 13-inch guns are rotated, the 13-inch guns elevated, ammunition hoisted for both 8-inch and 13-inch guns, rammers of 13-inch guns operated and special ventilation provided to blow gases out of bore of 8-inch and 13-inch guns; ten endless-chain ammunition hoists, two winch type of hoists, six deck winches and two winches of a compound geared type are moved by electricity. These battleships represent the intermediate stage between steam and electrically-driven auxiliary machinery. The use of electricity results in an economy of coal consumption.

Four new dry docks are under construction—at League island, Portsmouth, Boston and Mare island. The naval bill, passed at the last session of congress, authorizes the construction of two more docks—one at Brooklyn and the other at Norfolk, at a cost of $1,250,000 each.

So much for the navy, which after all is merely designed for the protection of that greater fleet—the merchant marine. The last report of the commissioner of navigation shows that the tonnage operating under our coasting laws, 21,397 vessels of 4,015,992 gross tons, is the largest in our history, and is greater than the coasting tonnage of any other nation. Our steam tonnage, 2,476,011 tons, for the first time exceeds the tonnage of all other craft. In the rest of the world steam tonnage eleven years ago exceeded sail tonnage. It is a pity that there is nothing encouraging to report of our foreign-going tonnage. Last year American vessels carried a fraction less than 9 per cent. of our exports and imports, the smallest percentage ever carried by them. It is quite clear that the American merchant marine cannot flourish in the foreign carrying trade against the financial encouragement given to the merchant marine of other nations. A bill has been introduced in the house by Mr. Payne and in the senate by Mr. Frye to remedy this condition. It provides for a maximum expenditure of $9,000,000 per annum, the bulk of it to go to cargo carriers, according to the tonnage carried and distance traversed. The bill, fortified with unanswerable arguments in committee, was not placed upon the calendar of either house or senate, and consequently is held over until the short session, which begins next December. There is reason to believe that the bill will be passed at the next session. It is necessary to the preservation of the American merchant marine in foreign carrying trade. It is vital to the development of the markets for American goods abroad. The enormous producing capacity of the United States, both agricultural and industrial, renders imperative the development of a foreign market. The work of a few months will supply the home market; the surplus must be expended abroad, otherwise production must cease. A well-developed foreign market prevents stagnation at home. It is idle to say that the only persons who profit from ships are the ship builder and ship owner. They benefit the merchant and manufacturer as well. They find a market for the products of the factory and the field. True, our goods may reach foreign countries in other bottoms, but they are not pushed as well. The world belongs to the ocean carrier, and the United States should reap all the benefit of its vast export trade. Today it only reaps a part of it.

The development in iron and steel ship building, which was noted in the last issue of the Blue Book, continues with unabated energy. New ship yards are springing up along the Atlantic and Pacific coasts. The New York Ship Building Co. is building a new plant at Camden, N. J., which will be one of the largest in the country. Work is being rushed and the company expects to bid for the new battleships and cruisers to be built by the United States navy. Ship construction will be begun there sometime during the present year. At New London, Conn., the Eastern Ship Building Co. is erecting an immense plant. The works of this company are primarily established to build two cargo carriers for the Pacific trade for James J. Hill of the Great Northern Railway. These carriers will be of 34,000 tons and will exceed in size anything afloat. Something of their size may be appreciated when it is said that they will be bigger than the Lucania and Campania put together and will have about five acres of deck space. As profit earning capacity and not speed is the end sought, they will be slow boats, designed for moderate coal consumption. The Wm. R. Trigg Co. of Richmond, Va., is adding extensively to its plant, being now engaged in an outlay of $800,000 in improvements. The new equipment will make it one of the largest ship building plants on the Atlantic coast. The Fore River Engine Co. of Weymouth, Mass., one of the latest in the field, has grown so rapidly that it has just purchased sixty acres of land at Quincy Point, Mass., two miles from its present site, for a new plant. The Cramps at Philadelphia have extended their works by the purchase of an adjoining ship yard, and the Newport News Co. at Newport News, Va., is just completing a very large dry dock and other additions to its plant. A healthful sign is the appearance of the American "tramp" steamer, which, nomad though it be, is the sure forerunner of a reviving merchant marine. The New England ship yards, too, are still building a type of very large sailing vessels, one of them a six-masted schooner, the largest that has ever been constructed. In the handling of that class of freight which depends more upon economy of movement than promptness of delivery, these vessels will have a distinct field of usefulness.

Since the opening of Alaska the Pacific coast has received a decided impetus in ship building. The Risdon Iron Works of San Francisco has engaged in general ship building. They are equipping a plant of sufficient capacity to build the largest type of ships. The Wolff & Zwicker Iron Works of Portland, Ore., is contemplating the erection of a ship building plant at St. John's. At the Union Iron Works, San Francisco, additions and improvements of considerable importance have been made of late, and the same is true in a proportionate degree of the smaller works. The development of trade with the orient will make the Pacific coast an important center in ship building. Of that there are sufficient signs already.

The approximate value of vessels built in ship yards of the great lakes during the past year is $10,500,000. Nearly all of these vessels are steel freight steamers of 450 to 500 feet in length and of 7,000 to 8,000 net tons capacity, equipped with quadruple expansion engines of 1,800 to 3,000 horse power and in most cases with water tube boilers. The year has, of course, been one of the most prosperous in the history of lake ship building, on account of the boom in iron and steel lines. There are still a large number of ships under construction in the lake yards, some of them not to come out until the spring of 1901, and there is every reason to expect, in view of the profits assured to ship owners by reason of contracts made last fall, a renewal of orders that will give the yards nearly as much work for another winter as they have had in the past year. If the number of new ships ordered for lake trade should be limited, the difference will probably be made up in steel freight steamers of about 3,000 tons capacity to be built for both lake and Atlantic service—vessels suited to passage through the Canadian canals from the lakes to the seaboard. The canal type of steamer is about 255 feet over all, 42 feet beam and 26 feet molded depth. About a dozen such vessels are now in commission on the lakes and they might be sent on to the seaboard for coast service at any time. The few that have gone to the Atlantic have proven so successful in the trade to Porto Rico and down the United States coast that it is proposed to equip four others, now under construction at the works of the American Ship Building Co., for all kinds of service on salt water as well as on the lakes. Companies are forming for the construction and operation of a very large fleet of steamers of this kind and it is expected that the lake builders will profit largely on this score.

REAR ADMIRAL SAMPSON ON ARMAMENT.

Rear Admiral Sampson was somewhat surprised by the navy department's decision on the superimposed turret question. After reading the despatches saying that the secretary of the navy had approved the findings of the board recommending that three of the five new battleships shall be built with superimposed and waist 8-inch turrets, Admiral Sampson said:

"I am surprised because the board did not recommend that the five ships have superimposed turrets or that none should have them. I cannot quite understand the decision. It seems to indicate, according to the newspapers, that there is uncertainty regarding the superimposed turret question. On the trial of the Kentucky, when I was on board, the practicability of the double turrets was made perfectly clear and satisfactory. The newspapers say that the two other battleships are to have quadrilaterally arranged 8-inch turrets. That is to say there are to be on each vessel two 12-inch turrets, one forward and one aft, and four 8-inch turrets, two on each side. Between the 8-inch turrets there will be several 6-inch guns on each side. Each of the five vessels will carry four 12-inch and eight 8-inch guns. Now in my opinion the ships will be too heavily armed although they are to be of more than 14,000 tons each, while the Kearsarge and Kentucky are only 11,600 tons. I don't believe in loading a ship too liberally with heavy guns. I cannot see how the board of thirteen officers arrived at such a peculiar decision. There seems to be an idea that ships cannot carry too many heavy guns. Eight-inch guns are pretty heavy pieces, and they are not very much more effective than 6-inch guns for general purposes."

In reply to a question as to his personal preference in the arming of the five new battleships Admiral Sampson said: "It seems to me the most efficient battery and all that the vessels should carry would be two superimposed turrets, one forward and one aft, exactly like those on the Kearsarge, and for broadside, sixteen 6-inch guns, eight on each side. This arrangement would meet all exigencies. The 6-inch battery would be remarkably powerful and easily and quickly handled. The 6-inch gun is the most efficient all-around piece. Sixteen 6-inch guns ought to meet almost any demand."

INITIAL TRIP OF THE DEUTSCHLAND.

The Hamburg-American liner Deutschland will leave July 6 from Plymouth for her initial trip across the ocean. She is supposed to be the fastest liner afloat. Considerable interest, therefore, attaches to the trip. The holder of the transatlantic record to date is the Kaiser Wilhelm der Grosse of the rival German line. The Deutschland is 686½ feet in length, 67½ feet beam and 44 feet depth. Her engines are of 35,000 horse power and are intended to drive her at an average speed of 23 knots. The Deutschland has several new features, even for an Atlantic liner. For instance, she has a grill room on the main deck for those passengers who desire a steak or chop, a gymnasium for the athlete and a play room for the children.

A bill is before the Canadian parliament to empower the Dominion Atlantic Railway Co. to buy the business of the Yarmouth Steamship Co., operating a line of vessels between Yarmouth and Boston. The price is $350,000.

MARINE REVIEW

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The minority report of the special naval board on the superimposed turret question is a powerful document. It is signed by Rear Admiral Frederick Rodgers, president of the board; Rear Admiral Charles O'Neil, chief of ordnance; Capt. C. D. Sigsbee, Capt. W. H. Brownson and Naval Constructor D. W. Taylor. In its eight paragraphs it condenses the objections to the superimposed system and it must be confessed that they constitute a powerful array. Among them are those which have already been mentioned in the Review. Particular stress is laid upon the fact that a single shot may cripple the turret and thus place all four guns out of action. For the benefit of those interested the minority report is reproduced in full:

"While conceding that certain advantages are gained by disposing the eight 8-inch guns, the location of which is the only point at issue, in the manner recommended by the majority, namely, four in superimposed and four in waist turrets, the minority are of the opinion that such advantages are neutralized to a great extent, if not outweighed, by the disadvantages attending such installation. The lack of independent action of the 8-inch guns in the superimposed turrets recommended by the majority is believed by the minority to be a decided disadvantage. The fact that the superimposed turrets contain four guns, two of which differ from the other two in caliber, range, energy and rapidity of fire, and all of which must move together in the horizontal plane, is, by the minority, considered objectionable, and it believes that the efficiency of the individual guns of the group is impaired by such an arrangement, and that guns so placed and so circumscribed will deliver a less volume and a less accurate fire than would be the case were the 8-inch guns mounted in an independent turret. The minority is of the opinion that the best practice requires that guns on shipboard should be isolated as far as practicable, rather than concentrated in groups of four. Guns are placed in pairs from the force of circumstances and on account of conditions which cannot be overcome on shipboard, not for tactical advantages, but at a tactical sacrifice. Among the objections which the minority find to the superimposed system and waist turrets recommended by the majority, is that in the superimposed turret there is a great concentration of weight towards the extremities of the vessel, and an enormous weight on the roller path of the superimposed turrets. Other objections are that the efficiency of four important guns is dependent upon one controlling apparatus, any accident to which would put them all out of action for a time at least; that a heavy projectile striking either the upper or lower turret would probably disable four guns; that the independent firing of the four guns would probably have a disturbing influence upon the accuracy of the individual guns; that the error of one gun pointer enters into four guns; that the working of the apparatus necessary for the service of four guns in the confined space allowed will have a disturbing influence on the gun servants. The saving in weight which is claimed for superimposed turrets is by no means as great as is supposed, and in fact is of but little moment in vessels of the dimensions of these under discussion. The use of waist 8-inch turrets as recommended by the majority seriously interferes with the mounting of secondary guns. If concentration of guns and their movement in unison in the horizontal plane is desirable, the question naturally arises, to what extent is it desirable? Certainly not to all the heavy guns of the main battery, and the minority is of the opinion that it cannot be judiciously extended to more than two guns. In case the necessity should arise to remove a gun or injured mount from a lower turret the labor of so doing would be very great in the case of the superimposed turrets, as the 8-inch turret and guns would have to be removed."

Now the singular fact is that after having signed this report four of these five members voted, as a compromise and to relieve the department of embarrassment, to equip three of the five battleships with superimposed turrets. The fifth member, Naval Constructor D. W. Taylor, was true to the faith that was in him. He held that of the two plans one was the better and that all five vessels should be built upon it. There was no compromise in him—and indeed having signed the minority report there should have been no compromise in any of them. In this case the four have shut their eyes to the force of their own arguments.

There has not been in recent years so appalling a catastrophe as the burning of the Saale, the Main and the Bremen at the piers of the North German Lloyd Co. in Hoboken, N. J., last Saturday afternoon and night. It was more appalling than fire at sea, since they were in sight of apparent succor. The fire started from a burning bale of cotton on the pier. A strong wind was blowing and in a few moments the fire had spread to several piers. Every effort was made to release the boats moored to the piers, but the steel hawsers had to be chopped apart and before the boats could be released they were all in flames. The Kaiser Wilhelm der Grosse was the only boat to get away practically without damage. The horror of it all lay in the fact that the crews were penned in the holds and that the fire was so intense that no one could approach to get them out. It is estimated that 120 lives were lost. Streams of water were poured in through the portholes to assuage their sufferings as much as possible, though there never was at any time any hope of saving their lives. It was the most heartrending spectacle to which humanity was ever subjected.

And yet in the midst of it all it is reliably reported that the work of rescue was interfered with by captains of tug boats who wanted to barter their services and who were more attracted by the prospect of profitable salvage than they were moved by any dictates of humanity. In one case it is recorded that when the chief engineer of one of the liners seized a hose to direct the water upon a burning group it was wrenched out of his hands by the captain of a tugboat who feared that it might be destroyed by the heat. That man should have been shot on the spot. If the law has any hold upon him now it should be exercised. Let it be hoped that the story is not true. The North German Lloyd Co. is doing all in its power to ascertain the list of dead and to comfort and assist their families. The loss is estimated at $5,000,000.

The two battleships, three armored cruisers and three protected cruisers authorized in the naval appropriation act passed in June last have been named by President McKinley. The names of the battleships are Virginia and Rhode Island, the armored cruisers Maryland, Colorado and South Dakota, the protected cruisers St. Louis, Milwaukee and Charleston. This is the third Virginia to occupy a place on the naval register. The first was a wooden vessel built in 1818 and broken up on the stocks in 1874. The next Virginia was called Virginia II and was a screw steam vessel of 581 tons and seven guns. She was bought by the government in 1863 and sold in 1865. A Rhode Island, too, of the paddle type was bought in 1861 and sold in 1867. One of the first vessels of the navy was named Maryland. She was a sailing vessel of 380 tons and was sold during the early part of the present century. The navy also built a Colorado, a screw steamer, in 1855. She carried forty guns. The first St. Louis of the navy was converted into a receiving ship at League island. The first Milwaukee was sunk by a torpedo in March, 1865. She was an iron clad of 970 tons and carried four guns.

Rear Admiral John Woodward Philip, commander of the Brooklyn navy yard, died last Saturday at the navy yard. He was one of the best-known, best-liked and most-respected men in the United States navy. In moral fiber he had no superior. During the Spanish-American war he was in command of the battleship Texas, and it was he who checked the cheering of his crew when the Almirante Oquendo was sinking. "Don't cheer, boys," said he, "the poor devils are dying." This epigram is in striking contrast to the cheap and bombastic ones which were credited to some of the other commanders. The religious side of Philip was intense. It entered into all of his actions. His religion was not a part of his garment; it was a part of him; and there was no more simple, unaffected act during the entire war than that of Philip when he bowed his head on board the Texas at the moment of victory, and in the presence of his crew acknowledged his belief in God Almighty. One may say of him as Antony said of Brutus: His life was gentle and the elements so mixed in him that nature might stand up and say to all the world: This was a man.

Mr. Eugene Tyler Chamberlain, commissioner of navigation, has just issued a forecast of his annual report. He shows that during the fiscal year ended June 30, 1900, the total tonnage officially numbered amounted to 417,034 gross tons. The total additions to our merchant marine have been greater than those of any year since 1856. But there is one singular defect—only one vessel was built during the year exclusively for the foreign trade, and indeed the tonnage registered for the foreign trade is slightly below that of 1899. Could any more convincing evidence be offered of the need of governmental stimulus? Unless legislation is had favorable to American shipping the United States will cease in course of time to have a single vessel in the foreign carrying trade. The signs of decay are plain. Of the vessels built during the year 56 per cent. were steam vessels. The report shows that for the first time since 1865 the total documented tonnage of the United States has reached 5,000,000 gross tons.

Coal Trade, a very well informed journal of Pittsburg, advances the opinion that the total lake movement of soft coal to the northwest during the present season will be over 6,000,000 tons, of which the Hocking region will ship 500,000, the West Virginia fields 700,000 and Pennsylvania 5,000,000 tons. The Pittsburg journal also expresses the opinion that no great effort will be made by the shippers to reduce lake freights, but that they will be inclined rather to hurry shipments as much as possible, and in view of the disastrous results of delays in some previous years try this season to have all of their coal shipped considerably in advance of Nov. 1.

Summer outings.—Before deciding when and where to spend a portion of the hot season this year, send for the booklet issued by the Nickel Plate road, entitled "Summer Outings," including many picturesque points on the south shore of Lake Erie and the classic shores of Lake Chautauqua. Sent to any address upon application to B. F. Horner, general passenger agent, Cleveland, O. No. 101, July 6.

"COMMERCE DESTROYERS."

ENGLAND HAS NONE OF THEM AND OF COURSE RIDICULES THOSE OF FRENCH DESIGN—THE GUICHEN, LATEST FRENCH SHIP OF THIS CLASS—A RECORD OF 24 KNOTS ON A FOUR HOURS' TRIAL.

The commerce destroyer is a type of ship unknown in the British navy, though some of the admiralty's critics might assert that many of our cruisers come very near it in the matter of small proportion of guns to displacement. That, however, is by the way. the role of a commerce destroyer is—for some reasons not particularly clear—presumed to be moral rather than physical, using moral in the sense of effect. It is assumed that a craft of this sort will not need to show her teeth, but having overhauled the swift liner, the latter will promptly strike. Should an obstinate captain be encountered, a little powder may be required, and for this purpose the commerce destroyer of true theory carries a few guns. Deck-protected herself, the odd gun or two that the victim may carry will not be likely to do any particular harm, while the exposed engines and huge bulk of the liner will render her the easiest of vulnerable targets. Consequently the "commerce destroyer" proper, though of a first-class cruiser's bulk, is less heavily armed than an Elswick cruiser of half to one-third her size, and would probably have to run from such an one. Speed and an immense coal supply are the principal desiderata.

The "commerce destroyer" is an American invention, the pioneer vessels being the Columbia and Minneapolis (duplicates), details of which will be found below. So far as America is concerned, they were also the last, the navy department recognizing the weak side of such ships. France, however, took the matter up, seeing visions of a good deal of la gloire, with a substantial backing to it, in a fleet of vastly swift ships designed to sweep the British merchant service from the sea. Hence the Guichen, Chateaurenault and Jurien de la Graviére—the sum total of this particular fleet so far. After France, Russia was bitten with the idea, and the three Pallada class were laid down. They, however, are merely rather large second-class cruisers, and carry so many 12-pounders that they may turn out to be cruisers of a very efficient type. However, Russia has apparently dropped the idea for the same reason that the United States and France dropped it, that such ships are not an addition to a navy's fighting strength at all commensurate with the expense. The Variag, the Russian cruiser building at Cramp's, Philadelphia, carries four more 6-inch guns than the Palladas on very nearly the same displacement, and would certainly not have to run from a smaller cruiser. Her contract speed, too, is higher. In America the new armored cruisers, in France the Jeanne d'Arc and others, are all designed to be as fast as the Guichen, while they are far better armed and armored. The Jurien de la Graviére, too, is no longer designed to carry a nominal armament for her size, but will be practically a second-class cruiser. Details of these ships are:

	Guichen.	Chateau-renault.	Jurien de la Graviére.	Columbia.	Pallada.
Displacement	8277	8018	5500	7475	6630
Length, feet	436½	457½	439⅔	413½	406
Beam, feet	55	55¾	48½	58½	55
Draught (mean) feet	24½	22½	23¾	24	21
Horse-power	24,000	23,000	17,100	21,500	11,000
Speed, knots	23	23	23	23	20
Coal, tons	1460	1400	600	2000	900
Coal, maximu u	2060	2100	900	2400	1430
Armor deck, inches	3	3			
Guns	2 6.4 in. 6 5.5 in. 10 3-pdr. 5 1-pdr.	2 6.4 in 6 5.5 in. 10 3-pdr. 5 1-pdr.	8 6.4 in. 10 3-pdr. 6 1-pdr.	1 8 in. 2 6 in. 8 4 in. 12 6-pdr. 4 1-pdr. 4 Gatlings.	8 6 in. 20 3 in. 8 small.
Torpedo tubes	2	none.	2 (sub.)	2	4
Nominal radius with full bunkers, in miles	16,000	10,000	9,300	13,000	?

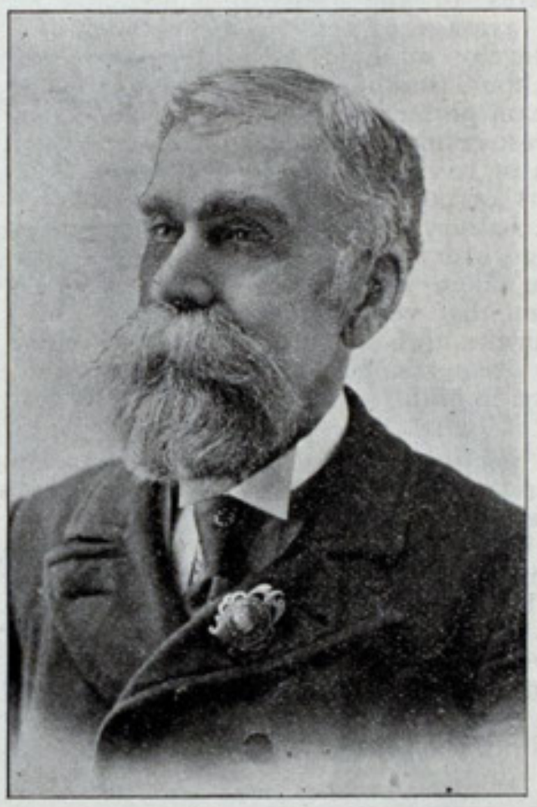
Both the Pallada and Jurien de la Graviére are compromises. It is worthy of note that the Columbia was laid down ten years ago, and she has made her speed, so that "commerce destroyers" do not look to be progressive in this respect. Whatever their speed, however, destroyers are faster and given an ideal commerce destroyer able to show her heels to all the cruisers in the world, there is a good deal in the British navy theory that destroyers would run such craft to earth. A big ship going about wreaking havoc on merchant shipping is bound to leave a certain amount of "trail," and three or four destroyers looking for her would probably not be long in finding her; and having found the finder would have little trouble in sending her below at night unless her captain was very smart, for the guns carried to repel destroyer attack are few. If any attempt is made to remedy this—as in the Pallada—something very like an ordinary cruiser is the result. Hence, the ideal commerce destroyer is likely to remain a poetical conception.

So far as this sort of ship goes, however, the Guichen may be reckoned the best specimen. She is undoubtedly fast, nor have we anything in the way of cruisers at present within two knots of her, though in actual warfare such a two knots is not likely to mean all that it does on paper. In a long chase at high speed something is pretty sure to go in one or both ships, and the next big war is pretty likely to see some stout 18-knotter coming into port with a 22 or 23-knot prize that she has chased and caught. The personnel down below must always be a factor in affairs of this sort, and there is a world of difference between the measured mile and a twelve-hours' chase at sea. However, the Guichen has done very well in some fairly hard tests. The results of her official trials were: Twenty-four hours, natural draft, 18,500 indicated horse power, 20 knots; four hours, forced draft, 25,455 indicated horse power, 23.55 knots. In other trials she has done 24 knots and a little over in short runs, and some while since ran through the Straits of Gibraltar at a speed estimated by those who watched her as "well over 22 knots."

The Guichen is a triple-screw ship, her engines vertical triple-expansion, a set to each shaft. The boilers are of the Lagrafel d'Allest type, and there are thirty-six of these. These boilers are apparently out of favor in France at present, most or all the new ships being fitted with other types, though the Charles Martel, which is also fitted with them, is said to be one of the best steaming ships in the French navy. The Chateaurenault has the Normand-Sigaudy boilers, the Jurien de la Graviére will have Normand. The Columbia, by the way, which has done some harder high-speed steaming than any warship, has cylindrical boilers. Those of the Pallada type are Belleville. One curious item in connection with the Guichen is that she is "very like a passenger liner." So, at least, the French used to tell us; and she was designed with a view to being mistaken for such. What liner the architect had in view we cannot pretend to say. The nearest is—or rather was—the Kaiser Wilhelm der Grosse, but she is more than half as long again, and certainly is quite unlike the Guichen in the stern, while it would need a good deal of haze to obliterate a score of other differences. All the same, this idea of getting the Guichen taken for a simple liner in the next war has been the cause of a good deal of trouble to the French admiralty. When the Guichen was commissioned—she is now with the Northern Fleet—difficulty was experienced in coaling her rapidly, there being no mast convenient for a Temperley. A third mast amidships was projected as a simple solution of the difficulty, but pending the creation of a liner similarly rigged the idea met with disfavor. Consequently a short Temperley was rigged upon a davit. It did not give unlimited satisfaction, so there was a question of sacrificing the liner ideal or else failing to make the most of the science of coaling ships. In the end the Temperley won, and the Guichen now sports a mainmast on which she can sling a full-sized transporter, and there has been a corresponding gain to her appearance, despite the lost ideal. But he would have been a very simple merchant skipper who could ever have taken the Guichen for a peaceful liner, let alone the side issue that in war time any number of armed liners will be about. That particular item does not appear to have struck the French minister of marine—M. Lockroy, probably—who conceived the otherwise brilliant idea of a French cruiser steaming gaily along with all the enemy's merchantmen following her blithely and innocently like the children after the Pied Piper of Hamlin.—Engineer, London.

CAPT. CHANCY RICHARDSON.

Capt. Chancy Richardson of Ashtabula, who died of heart disease while seated at dinner on the steamer Samuel Mitchell off Stannard rock, Lake Superior, on Friday last, was well known to vessel men of the lakes. As deputy collector of customs in the Cleveland district, having charge of the Ashtabula office, he formed a wide acquaintance among shipmasters, especially those engaged in the ore trade, and was highly respected by all of them. Capt. Richardson was in his sixty-eighth year, but his health had been such that his death was not at all expected. The trip to Lake Superior on the steamer Samuel Mitchell was being made with Mrs. Richardson and several friends. The party was a happy one, enjoying an excursion that had long been planned but which had a very sad ending. The steamer was bound up the lake, just above Marquette, when Capt. Richardson, while at dinner, was stricken very suddenly and died a short time afterward. The Mitchell put back to Marquette and the remains were conveyed by rail to Ashtabula for burial. The funeral, which occurred on Monday last, was largely attended by the people of Ashtabula, as well as many Cleveland friends, among them Mr. August Zehring who was collector of the Cleveland customs district under President Cleveland's last administration and with whom Capt. Richardson served as a deputy.



CAPT. CHANCY RICHARDSON.

Capt. Richardson was born in Unionville, O., Dec. 22, 1832, a son of Henry Richardson, who came to Ohio from Methuen, Conn. He sailed the lakes for a number of years and then engaged in grocery business in Ashtabula. It was during President Cleveland's last administration that he was appointed deputy collector of customs at Ashtabula, which post he filled with the utmost fidelity and success for five years, retiring last spring. He was a brother of Capt. W. C. Richardson, well-known vessel owner of Cleveland, and besides a widow leaves two sons, C. H. and ex-Mayor C. E. Richardson, both of Ashtabula.

NAVAL MATTERS.

The naval board of construction has decided to recommend the purchase of the submarine torpedo boat known as the improved Holland, the disposition of which was left open by Secretary Long when he bought the Holland.

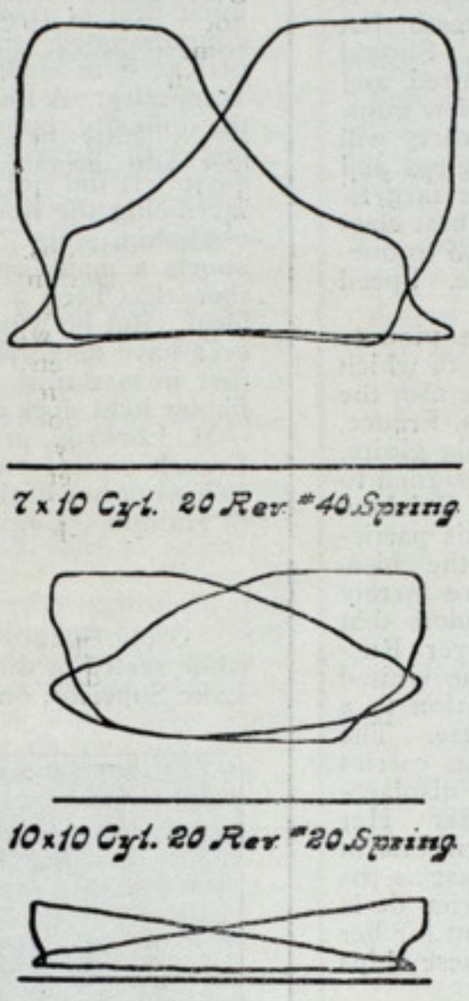
The cruiser Atlanta, which has been under repair at the New York navy yard for three years, being practically rebuilt in that time, has been ordered into commission. Commander Edwin C. Pendleton, superintendent of the naval gun factory in Washington, will command her.

The comptroller of the treasury has ruled that the last nine rear admirals of the navy are entitled to only the pay of a brigadier-general, from which 15 per cent. may be deducted when they are on shore duty. Rear Admiral Silas W. Terry raised the question by demanding the pay of a major-general. Admiral Terry supported his case by citing section 13 of the naval personnel bill, which provides that officers of the line shall have the same pay and allowances as army officers of the corresponding rank, and as the rear admiral corresponds to a major-general, he held that he should receive the same pay. The comptroller pointed out that section 7 of the same act directly stipulated that the nine admirals in the second division shall receive the pay of brigadier-generals, and held that a general law does not repeal a special law.

HIGH-DUTY BOILER FEED PUMP.

BY CHAS. L. HEISLER, M. E.

Until within the last few years very little attention has been given to the development of the extremely-wasteful, direct-acting boiler feed pumps, which from repeated tests made by engineers in the United States navy are shown to use on an average not less than 120 pounds of steam per I. H. P. per hour, and the best economy obtained was 93 pounds. The common form of direct-acting steam pump of today is not as far advanced in the economical use of steam as was Watt's steam engine. It must, however, be conceded that it is an extremely difficult problem to produce a high-duty direct-acting pumping engine, and at the same time have it embody all those desirable features of the ordinary direct-acting pump which enabled it to practically monopolize this and other fields of work in spite of its wastefulness. It must have a minimum weight consistent with ample strength; it must be compact as well as accessible, and of simple construction, so that it can be operated by men of ordinary experience and intelligence. A high-duty feed pump fulfilling these requirements would meet with great favor, particularly as the cost of fuel is continually advancing and the work required of feed pumps is becoming more severe and increasing in proportion to the rise of steam pressure and enlargement of boiler capacities that are necessary to meet the greater economy and power demanded of the ship's engines.



To feed a 2,000 or 2,500 H. P. battery of boilers, sizes which are now common even on freight steamers of the great lakes, at least 14 to 20 I. H. P. must be developed by the main feed pumps, requiring from 2 to 3½ tons of coal per day when using the ordinary direct-acting pumps. Evidently the fuel burned for this purpose will be no small item on ocean steamers developing ten to fifteen times as much power. Repeated tests made by different experts of the high-duty feed pump illustrated herewith show it to have solved the problem of not only giving high duty, but also retaining all the more desirable features of the older forms of direct-acting pumps. The average of results obtained show that it will readily develop an I. H. P. on less than 26 pounds of steam per hour, running condensing with only 110 pounds of steam pressure. This is much less than one-third of the best results reported by the engineers of the United States navy, and represents a saving of 1½ to 2½ tons of coal per day when feeding a 2,000 to 2,500 H. P. battery of boilers. It also saves its own weight of cargo every two days. From the indicator cards that were taken when running non-condensing, it will be seen that very much better results are to be expected from the high steam pressures now common in marine practice, and on large ocean steamers the fuel saving would be as high as ten to fifteen tons daily, in addition to the saving of weight of the coal as cargo.

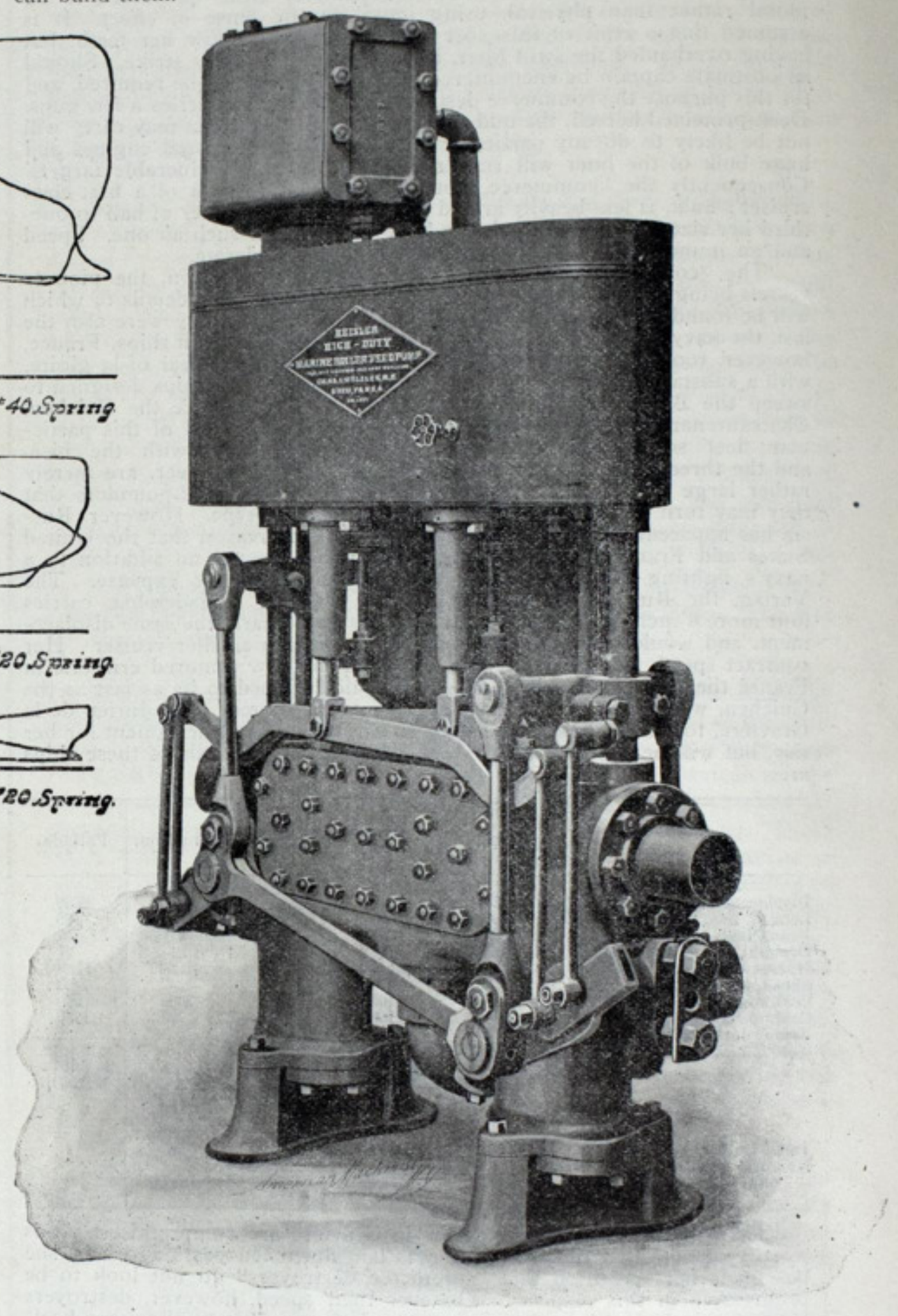
These pumping engines have a positive and fixed length of stroke. By suddenly removing the water pressure, or admitting air to the suction, a speed of 175 revolutions per minute has been attained without shock or noise. All pumps for high pressure are fitted with outside packed plungers. A pump for feeding a 2,000 to 2,500 H. P. battery of boilers 125 pounds steam pressure has a three-cylinder triple-expansion steam end, with steam cylinders of 11, 16 and 25 inches diameter, and a 5½ by 12-inch water end. The valves are of the common "D" type, the high pressure valve being balanced. Larger pumping engines having from 3,500,000 to 4,000,000 gallons capacity are being developed for paper mill service. The three steam cylinders are 25, 40 and 60 inches in diameter and have 32 inches stroke.

A diagram and description of the compensating device can be found in the reports of the last meeting of the American Society for Mechanical Engineers. It is of very simple construction, consisting of floating links that connect the rocker arms shown in the illustration, and which are arranged at the right and left sides of the water end, their purpose being to transfer the excess of force at the beginning of the stroke of one side to the other side when completing its stroke. A careful study of the mechanism will reveal that only a small portion of the power is transmitted through the floating links, and the forces acting through them are much smaller than those transferred by an ordinary connecting rod of a simple engine having a cylinder as large as the high-pressure cylinder.

SHIPPING BILL ARGUMENTS.

Following are fifteen reasons why the Frye-Payne shipping bill should be enacted into law at the next session of congress:

1. We are paying to foreign ship owners $200,000,000 each year for doing and carrying that might far better be done by American ships.
2. This $200,000,000 is taken out of the country each year, and, while diminishing our national wealth, denies to American labor in mine, in forest, in mill and in ship yard, the employment it provides for aliens in other lands.
3. During the past thirty-five years we have paid to foreign ship owners not less than $4,000,000,000 for doing our foreign carrying.
4. Unremedied we shall pay foreign ship owners $5,000,000,000 in addition in the next quarter of a century.
5. More money goes to foreign ship owners each year for doing our foreign carrying than is collected at American custom houses.
6. In 1861, when the republican party first came into control of the national government, 2,500,000 tons of American ships were engaged in our foreign trade, carrying 66 per cent. of our imports and exports.
7. In 1899 our shipping in the foreign trade aggregated 800,000 tons and carried less than 9 per cent. of our imports and exports.
8. In forty years our shipping in the foreign trade has declined two-thirds, while our foreign commerce has increased fourfold—from $500,000,000 to $2,000,000,000 in value a year.
9. Our shipping upon the seas has declined because it has been unprotected. It was not the change from wood to iron and from sail to steam, nor the Civil war, that destroyed our merchant marine in the foreign trade, but it was simply and only the lack of protection.
10. Foreign ships are built and run cheaper than American ships are. In addition, foreign governments pay over $26,000,000 each year in subsidies, subventions, bounties and other government and financial aids to their merchant shipping. Against such foreign shipping unaided American ships can not successfully compete.
11. Ninety per cent. of the cost of a ship is received by labor. It is the high cost of American labor and the unsteadiness of employment that makes it impossible for Americans to build ships as cheaply as foreigners can build them.



12. It is the better food furnished and higher wages paid on board American ships that makes it impossible to run them in competition with the cheaper built, cheaper manned, subsidized and bountied shipping of other nations.
13. Foreign ships are built and foreigners trained thereon in the carrying of our imports and exports. Thus our foreign commerce builds up and sustains the auxiliary naval vessels and men of our present rivals and possible enemies, while our own weakness upon the seas renders us almost helpless.
14. Our government needs the aid of merchant ships and experienced and trained men, as was amply demonstrated during our war with Spain. Pitted against a great naval and maritime power in our present condition, our weakness and helplessness upon the seas would involve us in widespread disaster and incalculable loss.
15. The reasons that make necessary and justify the subsidies and bounties paid by foreign governments to their merchant ships, make necessary and justify similar payments by the United States government to American ships.

When American ships on the ocean are protected like our industries are upon the land, the merchant shipping of the United States will be equal to all the needs of our foreign commerce.

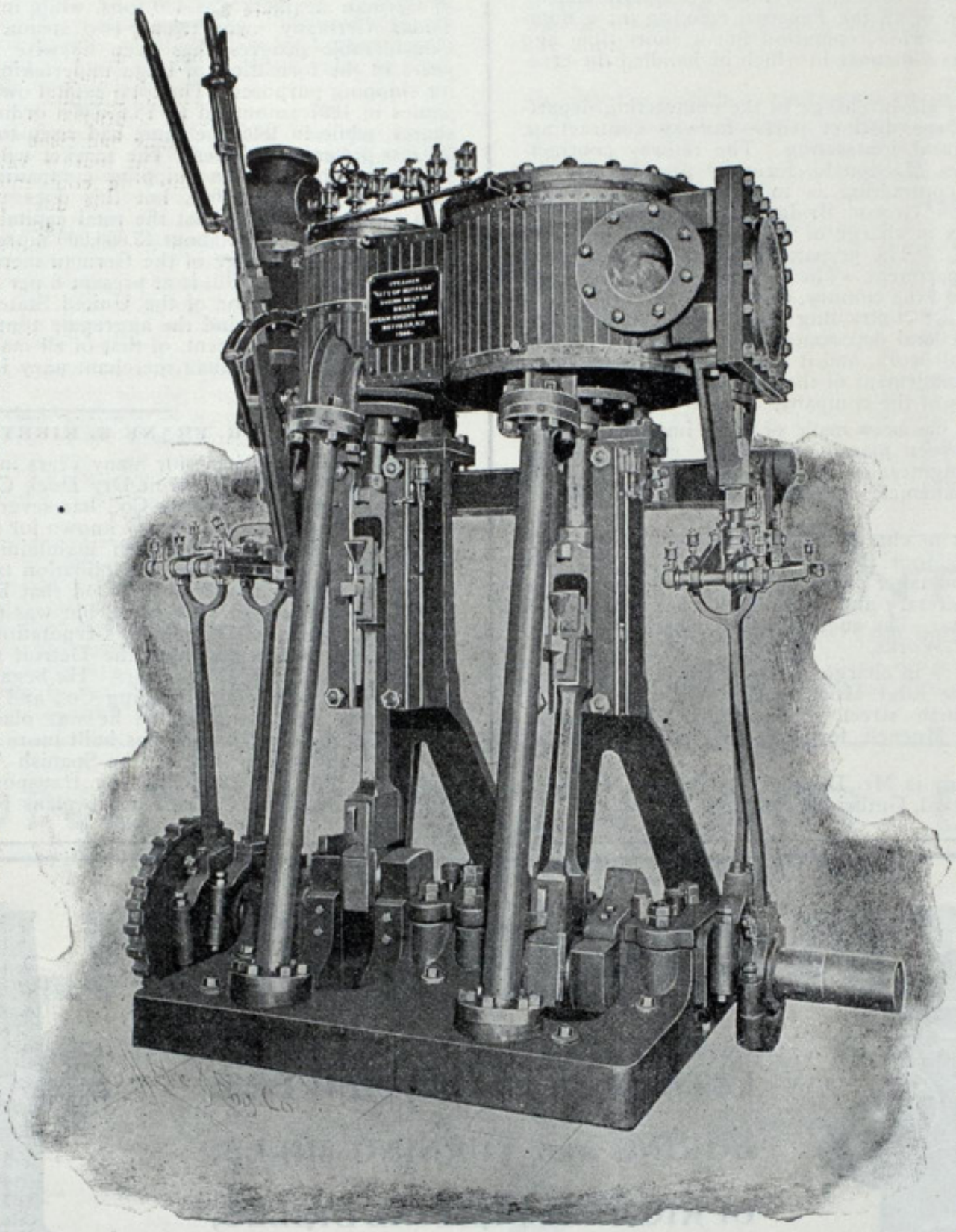
The Eastern Ship Building Co. of New London, Conn., although much delayed by the non-arrival of material and tools ordered months ago, is nevertheless rushing work upon its plant, and keels will be laid in August for the two Hill steamers—largest vessels in the world. The joiner shop, carpenters' shop and mold loft are completed and the work of laying down the first vessel has begun. The plate shop is practically completed and the machine shop and pipe shop is all in frame. As it is less than four months since the formation of this new company was announced, the management has done remarkably well in building the plant, especially in view of the very peculiar conditions prevailing in business generally at this time.

BELL COMPOUND ENGINES.

The accompanying illustration represents a fore-and-aft compound engine recently designed and built at Bell's Steam Engine Works, Buffalo for the steamer City of Buffalo, a passenger steamer used for pleasure purposes on Lake Chatauqua, New York. Steam is furnished at 250 pounds pressure by Roberts water tube boilers. Cylinders of the engines are of 12 and 26 inches diameter, with 14 inches stroke. The bedplate is of the regular box type, with facing pieces to receive the front and back columns. The crank shaft is of forged open hearth steel 6 inches diameter, with cast iron counterbalances bolted on, and runs in iron boxes lined with Magnolia anti-friction metal.

The cylinders are supported in the back by cast iron "Y" columns, having lugs to which are bolted steel slide bars of the locomotive type. The crossheads are of open hearth cast steel, with brass boxes in the connecting rods, and these are also lined with anti-friction metal. In the front the cylinders are supported by wrought iron polished columns. The cranks being set at right angles to each other, the cylinders are provided with receiver in connection with the belt around them, giving an effective steam jacket. The high pressure cylinder has a single-ported piston valve fitted with packing rings, while the low pressure cylinder is provided with plain slide valve and both operated by Stevenson links of the double-bar type connected with steel rock shaft and reversing lever. The piston and connecting rods are of the best open-hearth forged steel, and the throttle is of the balanced type.

This design of engine was carefully worked out on a basis of 600 to 700 feet piston speed per minute, great care being taken to have all the reciprocating parts accurately balanced to avoid jar. Quick delivery was required and the engine was shipped in sixty days after the order had been received; and this notwithstanding the fact that it was found, after starting the drawings, that the patterns which it was intended to use were not suitable and it was necessary to make new patterns for practically all the parts. The engine is of about 200 horse power.



COMPOUND ENGINE, BUILT BY BELL'S STEAM ENGINE WORKS, BUFFALO

LEGAL QUESTIONS INVOLVED IN A WRECK.

Buffalo, July 5.—The entire story, or even the most absorbing part of it, that has to do with the case of the schooner T. H. Howland would make a decidedly good-sized volume. It involves so much that lake men ought to know, and mostly would like to know for their profit as well as for general information and amusement, that at least a small chapter ought to be given on the proceedings. The poor schooner lies at the Buffalo breakwater with her decks out and generally forlorn. It was found that few men, not actually experts, imagined that there would be air enough in a coal cargo, or water pressure enough outside of it to take out a sunken vessel's decks. The first diver that went down to Howland reported that her deck engine had gone down through the deck, but this statement was disbelieved.

Then as to the liability of the cargo. As it was a matter of 650 tons of hard coal, some interested persons reasoned that it was worth $2,500—no doubt more than the vessel itself, and possibly much more at a depth of 50 feet. So it was argued that the cargo ought to pay the great part of the cost of raising both, and the vessel interest strenuously resisted all effort to take the coal out before the vessel was raised. It would not be of much account to rehearse the tactics that were resorted to by the three interests that entered the war over the vessel. As she lay in Canadian waters some of the proposed legal proceedings had to be dropped before they were begun, but there were a few injunctions and counter injunctions got out and made to add very materially to the cost of getting the vessel.

One of the things that were pretty clearly settled, for the thousandth time, was that it seldom pays to consult a lawyer who is not up on admiralty business, for his advice, as it appears to have been in this case, too often turns out to be very expensive. Had the vessel interest the case to conduct over again, in the light of the experience obtained by the events growing out of it, the vessel would hardly have been at present in the hands of the wrecking company that raised her, and with possibly a big bill on top of her value to meet besides, for it is understood that the price agreed on for raising her was $4 000.

But the point that carried most weight of all and showed that the insurance interests knew what they were about all along in resisting the effort to saddle on the cargo most of the cost of raising the loaded schooner, is that it is the best of law never to ask the cargo to contribute more to such a wrecking job than it would cost to raise it independent of the vessel. This point has been settled in the most positive way in Canadian admiralty litigation, and it stands to reason, of course. Now the insurance agents had let the job of raising the cargo at $2 a ton, and 150 tons had been taken out at a cost, it is said, of not over 70 cents a ton, when the vessel interest stepped in and stopped the proceeding. It was after that that so many war tactics, even to going out to the boat with a load of men to "clean out" the workmen on the schooner, only to find a bigger gang on her, were resorted to, all very expensive at the time, and all very "funny business" as looked at now.

It is not proper or at all desirable in this mention of the case to make disparaging allusions to anyone connected with it, for it was all a matter of acting on misinformation and failing to see the main point—that the cargo could not legally be made to pay more in assisting in the raising of the vessel than it would cost to pump it to the top of the water. A Canadian case where this fact was affirmed over and over in original decision and appeal after appeal was presented to the vessel interest to show what ought to be done, but without making any impression. It was only when the attorney for the wrecking company, who luckily happened to have some admiralty lore in his head, came down to look the case over that some real progress was made. He at once said that the insurance was in the right and that the other side would have to yield.

This was at length done and behold the contractor who was to raise the cargo, paying the wrecker $800 for his share of the contribution and making money by sitting down and doing nothing. At the outset the insurance had offered $1,350 for the cargo's share of the work. So the Howland case ought to go down to posterity as a celebrated one, though of course it stands small chance of doing so, if only from the fact that it did not go through the regular proceedings of a court. For this reason I have made the effort to record some of the points of real account in it.

JOHN CHAMBERLIN.

A LOVING CUP TO MR. BABCOCK.

Mr. W. I. Babcock, who retired from the presidency of the Chicago Ship Building Co. on July 1, was on Wednesday last the recipient of a beautiful solid silver loving cup, presented to him by the officers and employes of the company. During the ten years of Mr. Babcock's connection with the company, which he organized and brought to its present standing as the best equipped plant on the lakes and one of the best in the country, he has gained the esteem of every one who has been privileged to serve under him. Fortunate is any concern whose affairs are characterized by the harmony and good will obtaining in the Chicago yard and which have been remarked by all who have had an opportunity of seeing and judging of its workings. The presentation was made by Mr. O. R. Sinclair, the efficient and debonair secretary of the company. It is safe to say that Mr. Babcock, who responded feelingly, will cherish this cup as a remembrance of his connection with the lake ship building interests, which he has done so much to develop, and of the men who gave him their hearty co-operation. The cup bears on one of its three panels Mr. Babcock's monogram, on the second the monogram of the company and on the third the inscription "presented to W. I. Babcock by the officers and employes of the Chicago Ship Building Co. on his retirement from the presidency July 1, 1900."

Following upon Mr. Babcock's retirement Mr. Henry Penton, superintending engineer of the company, has also resigned, to take effect Aug. 1. Mr. Penton joined the company in 1896, when it was decided to establish an engine building plant, and that he is largely responsible for the splendid shops and equipment which have been developed since that time goes without saying.

AMERICAN BRIDGE COMPANY.

(Continued from page 13.)

charge over all employees and the operations of that particular plant. Where a number of plants are closely located, they are placed under one local manager, each plant having a superintendent. All managers are under the direct charge of a general manager, Mr. James P. Kennedy, formerly president of the Youngstown Bridge Co., who moves about among the various plants in order to see that all are working in one harmonious whole, and that each has the advantage of the experience of every other plant. The erecting is also in charge of the operating department, and this is under Mr. William Wennas as superintendent. Mr. Wennas has had full charge of all the Pencoyd erecting for a number of years and gained a world-wide reputation but a short time ago for the economical and expeditious manner in which he handled the erection of the famous Atbara bridge.

All the sales of the company are in charge of the contracting department. This is divided into three distinct parts—railway contracting, highway contracting and structural contracting. The railway contracting is in charge of Mr. Charles Macdonald, formerly president of the Union Bridge Co.; highway contracting is in charge of Mr. Frank Conger, formerly president of the Groton Bridge & Manufacturing Co., and the structural contracting is in charge of Mr. W. H. McCord, formerly of the Post & McCord Co. The preparation of all proposals and contracts is in charge of this department. The company has opened contracting offices in different parts of the country, each office reporting daily by wire to various members of the contracting department. This is one of the most important of the several departments, as here are made up the proposals and estimates on all work, and it might almost be said that on the careful judgment and management of the members of this department depends chiefly the success of the company.

The mechanical department has been made of equal importance with all other departments and has been placed in charge of Mr. James Christie (formerly mechanical engineer of the Pencoyd works), with the title of vice-president. The mechanical details of all the various plants belong to this department.

The financial department is in charge of Mr. William H. Connell, formerly president of the Edge Moor Bridge Works, as treasurer, with F. M. Wyant, formerly general manager of the Wrought Iron Bridge Co., and F. H. Schmidt, formerly secretary and treasurer of the Youngstown Bridge Co. as assistant treasurers. The auditor is Mr. Charles C. Price, formerly with the Pencoyd Iron Works.

The purchasing department is in charge of Mr. Francis W. Heisler, formerly purchasing agent for the Edge Moor Bridge Works, with headquarters at No. 259 South Fourth street, Philadelphia. The assistant purchasing agent is Mr. E. A. Muench, formerly purchasing agent for the A. & P. Roberts Co.

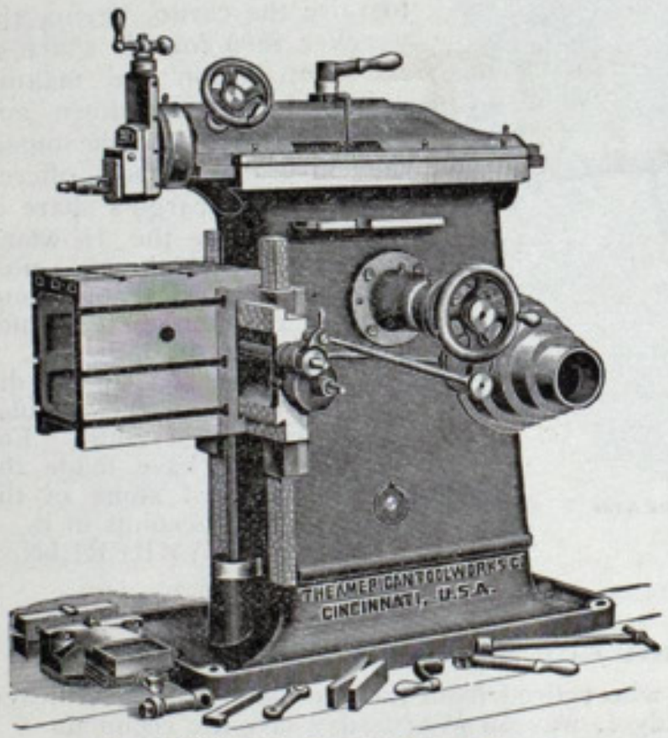
The secretary of the company is Mr. Douglas O. Morgan, formerly a member of the law firm of Seward, Guthrie & Steele.

GERMAN SHIPPING INTERESTS.

The remarkable development of the foreign trade of Germany during recent years has naturally been accompanied by a simultaneous increase of the German merchant navy. The "Memorial on the Growth of German Maritime Interests," recently laid before the German parliament by the imperial government, states that from 1873 to 1894 the total carrying capacity of the merchant navy of this country increased by 139 per cent., and that a further increase of 33 per cent. has taken place since 1894 until the beginning of 1899. According to information furnished by the Germanic Lloyd, the year 1899 shows an addition of seventy-two steamships and thirty-two sailing ships. The capacity of individual ships has also considerably augmented since 1873, for at that time the average tonnage of German steamers was 480 tons, while in 1898 it had risen to 849 tons. Today Germany owns twenty-two steamers of over 10,000 tons each. Considerable progress has been likewise made in this country of late years in the formation of large undertakings and joint stock companies for shipping purposes. The total capital owned by German shipping companies in 1897 amounted to £8,676,000 ordinary and £3,431,000 preference shares, while in 1899 the same had risen to £13,382,000 ordinary and £3,529,000 preference shares. The market value of the share capital of the Hamburg and Bremen shipping companies is estimated by competent authorities at £15,882,000, but this does not include numerous private ship owning firms, so that the total capital engaged in shipping in Germany may be taken at about £5,000,000 more than the sum last mentioned. The aggregate tonnage of the German merchant navy, as compared with that of the entire world, is at present 8 per cent., and ranks before that of France or Norway, or of the United States of America; it is, however, still considerably behind the aggregate tonnage of the British mercantile navy, which is 52 per cent. of that of all maritime countries together. The total value of the German merchant navy is at present estimated at £25,000,000.

MR. FRANK E. KIRBY RESIGNS.

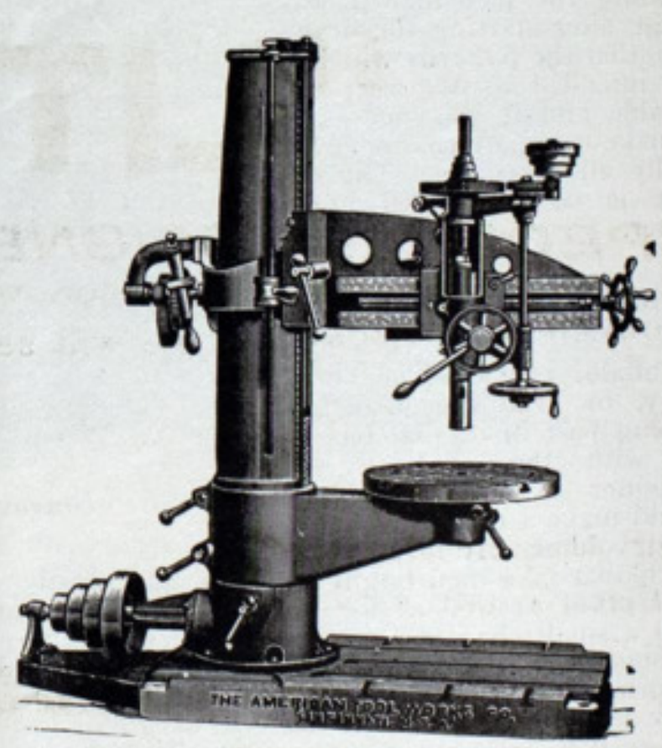
Mr. Frank E. Kirby, for many years in charge of all designs of hulls and machinery for the Detroit Dry Dock Co., now the Detroit branch of the American Ship Building Co., has severed direct connection with the company. It has been generally known for sometime that Mr. Kirby contemplated resigning. Although maintaining an office at the Detroit works he has not since the consolidation taken a very active part in the business. In fact it was understood that he contemplated resigning before the consolidation took place, but was prevailed upon to remain in a consulting capacity. Mr. Kirby's reputation as a designer is unexcelled. He has been connected with the Detroit and Wyandotte ship building yards for upwards of thirty years. He began as a young man as designer for the Wyandotte Ship Building Co., and when the Detroit and Wyandotte yards were consolidated he was placed in charge of the Detroit plant. During that time he has built more than 100 vessels and designed parts of many more. During the Spanish-American war the government employed him in remodeling the transports and his fame as a naval architect is national. Mr. Kirby's plans for the future are not yet announced.



New 16″ Back Geared Crank Shaper.

Machine Tools

LATHES, PLANERS, SHAPERS,
BORING and TURNING MILLS,
UPRIGHT and RADIAL DRILLS,
SCREW MACHINES,
PULLEY LATHES,
BOLT CUTTERS, Etc.


3′ Radial Drill.

The American Tool Works Co.,

BUILDERS OF COMPLETE LINES OF MACHINE TOOLS,

WORKS: CINCINNATI, U. S. A.

NEW YORK OFFICE: 120 Broadway, Geo. Place, Agent.
NEW ORLEANS: The Fairbanks Co.
CHICAGO STORE: 68-70 South Canal Street.
PHILADELPHIA: The Fairbanks Co.
CLEVELAND: The Strong, Carlisle & Hammond Co.
BOSTON STORE: 36 Federal Street.
BALTIMORE: The Fairbanks Co.

SAN FRANCISCO: Henshaw, Bulkley & Co.
DENVER AND SALT LAKE CITY: The Mine & Smelter Supply Co.
LONDON: Alfred Herbert, Ltd., 7 Leonard St., Finsbury, E. C.
DÜSSELDORF: de Fries & Co., Act. Ges., Graf Adolf Strasse, 83-87

ANTWERP: Nyssens Freres, 33 Rue des Peignes.
BERLIN: de Fries & Co., Act. Ges., Kloster Strasse, 13-15.
PARIS: Roux Fréres & Cie., 54 Boulevard du Temple.
MOSCOW: Alfred Stucken.

HAYDEN & DERBY CATALOGUE.

The Hayden & Derby Manufacturing Co., 85-87-89 Liberty street, New York, has issued a new price list and catalogue of 44 pages, 6 by 9 inches in size, dealing with the various types of Metropolitan injectors and H. D. ejectors of which they are the sole manufacturers. The catalogue is finely illustrated and has for a frontispiece an excellent view of the company's plant at Bridgeport, Conn., one of the most complete and modern establishments of its kind in the world. In addition to a detail description of the Metropolitan automatic injector, Metropolitan "1898" injector, and Metropolitan double-tube injector, the book contains much interesting information on the subject of injectors generally with suggestions as to the proper type and size of injectors for the most satisfactory and economical results. Special attention is directed to what injectors of the company's manufacture will accomplish under various conditions, and the different forms of H. D. ejectors are fully illustrated and described. Copies of the catalogue may be obtained upon application to the Hayden & Derby Manufacturing Co. and should prove of value to engineers and steam users for ready reference.

The Sherwood Manufacturing Co. of Buffalo, N. Y., has just issued an injector and ejector catalogue. They are manufacturers of Sherwood double-tube injectors, Buffalo automatic injectors, Eagle ejectors and Buffalo drive well ejectors. Since the invention of the injector, nearly fifty years ago, no improvement or device has been added to the equipment of a steam engine plant of more importance than the injector method of feeding water to the boiler. On its perfect operation depends the running of the engine and the safety of those in charge. All the injectors sent out by the Sherwood Manufacturing Co. are tested, which is a guarantee that they are sent out in proper condition.

A circular just issued to stockholders of the American Ship Building Co. announces that the annual meeting for the election of directors and for the transaction of such other business as may be presented at the meeting, will be held at the office of the company, No. 60 Grand street, Jersey City, N. J., on Wednesday, the 25th inst. at 11 a. m. For the purposes of this meeting the stock transfer books of the company were closed at 3 p. m. on July 3, and will not be opened again until 10 a. m. on Thursday, July 26.

CHART NO. 1 OF ST. MARY'S RIVER has just been issued. Vessel masters of the great lakes have been looking for it for a long time past. It shows on a very large scale all the lower part of the river extending down from the lower end of Mud lake, where chart No. 2 begins, and including Detour, Drummond island and the lower part of St. Joseph's island, east and west, extending over to what is known as the North channel. This chart may be had from the Marine Review at 50 cents, or all three charts of the river at $1.50.

COURSE IN MARINE ENGINEERING.

The course in marine engineering and naval architecture which has been organized in the engineering department of the University of Michigan will be offered to students with the opening of the University in September. Professor Mortimer E. Cooley, now professor in mechanical engineering, will give the instruction in marine engineering. Herbert C. Sadler, assistant professor in Glasgow University, Scotland, has been appointed junior professor of naval architecture. The course as organized is a graduate course requiring five years' residence at the University. The studies for the first three and one-half years are the same as those in the regular engineering courses. The special work begins the second semester of the fourth or senior year and continues through the fifth year. At the end of the fourth year the student receives the degree of bachelor of science in engineering, and at the end of the fifth year the degree of master of science in engineering.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of July 3, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire	31⅞	32	31½	31⅞
American Steel & Wire, Pfd	71¾	.....	.....	71¾
Federal Steel	32¼	32½	31¾	31⅞
Federal Steel, Pfd	64	.....	.....	64
National Steel	24	24	23¾	23¾
National Steel, Pfd	84	.....	.....	84
American Tin Plate	19	19½	19	19½
American Tin Plate, Pfd	73⅜	.....	.....	73⅜
American Steel Hoop	19	19½	19	19½
American Steel Hoop, Pfd	67¾	.....	.....	67¾
Republic Iron & Steel	53½	.....	.....	53½
Republic Iron & Steel, Pfd	10⅜	.....	.....	10⅜

WANTED.

A first-class steam barge, 1,000 tons or more capacity, suitable for coarse and package freight; vessel to be in first-class condition. Answer stating lowest cash price. Address F. W. Putnam, 720 Old Colony Bldg., Chicago, Ill. July 12

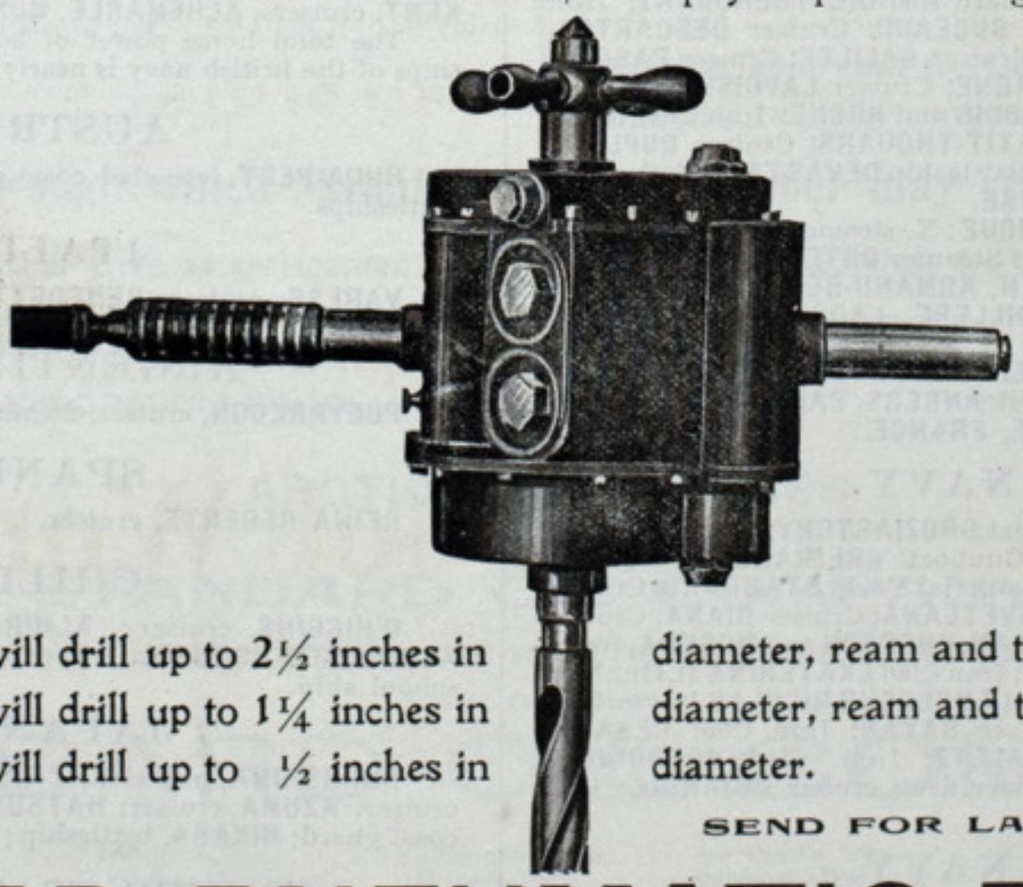
THE ONLY PISTON AIR DRILLS

That have Double-Balanced Piston Valves are the

"LITTLE GIANT"

SPECIALLY DESIGNED FOR SHIP BUILDING.—They consume fifty per cent less air and do far more work than rotary or any other type of air drills. If you want to verify this we will send a machine on trial, and pay express charges both ways.

Our Machines are made to withstand hard service. They can be operated in a bath of oil. Used by 85 per cent of the railways in this country. Absolutely no vibration.



Guaranteed against repair for one year. Made entirely of steel. Can be operated close to a corner and in any position. We can furnish them in any size.

No. 1.—Weight 27 lbs., will drill up to 2½ inches in diameter, ream and tap up to 2 inches.
No. 2.—Weight 17 lbs., will drill up to 1¼ inches in diameter, ream and tap up to 1 inch.
No 3.—Weight 8 lbs., will drill up to ½ inches in diameter.

SEND FOR LATEST CATALOG.

STANDARD PNEUMATIC TOOL CO.

Manufacturers of Pneumatic Tools of All Kinds,

Marquette Building, CHICAGO. 141 Broadway, NEW YORK.

NOTES FROM ATLANTIC COAST SHIP YARDS.

The new steamer George P. Squires, built by the E. J. Codd Co., Baltimore, Md., was successfully launched a few days ago. She was christened by Miss Abbie Callus. The Squires is to be used in the menhaden fisheries. She was constructed for Bellows & Squires of Whitestone, Va. She is 120 feet long, 22 feet beam, and 9 feet depth of hold, the hull being of oak, planked with yellow pine. She will have an engine of the steeple compound type, with cylinders 13½ and 26 inches in diameter by 20 inch stroke. The boiler, of Scotch type, is 10½ by 11 feet.

A new freight steamer, or steam barge, the Major Barrett, has been completed at the ship yard of the Jackson & Sharp Co., Wilmington, Del. She is 185 feet in length, 34 feet beam and 13 feet 6 inches depth of hold. The engine, by the Neafie & Levy Ship & Engine Building Co. of Philadelphia, is of the compound type, 20 and 40 by 28 inches. It is supplied with steam by a Scotch boiler, 14 feet 9 inches by 12 feet. The steamer is owned by the Barrett Mfg. Co. of Philadelphia, and will be used in carrying tar between Philadelphia and Boston.

Work is progressing rapidly on the five-masted schooner being built in Bath for Capt. Mitchel Reed, formerly of the schooner Geo. E. Walcott, and she will be launched about the last of July. She is 265 feet long, only 36 feet shorter than the big six-master being built by same firm, Percy & Small, for Capt. L. W. Jewett, and will be named William C. Carnegie, for a nephew of Andrew Carnegie, the steel manufacturer. Mr. Carnegie will attend the launching with a party of his friends.

The New England Co. at Bath, Me., stretched the keels for two new schooners last week. One of them, a 900-tonner, is for Capt. S. C. Tompson, of Matawan, N. J., and the other, an 1,100-ton craft, is for Capt. Geo. L. Kelsey, of Clinton, Conn. Of the other work in the yard the four-master for Capt. Wylie is two-thirds planked. The vessel will go overboard in July.

The fourth section of the new dry dock for the Tietjen & Lang Dry Dock Co. has been received from the builders and the fifth section is well under way. The dredging work on the proposed site of the new dock is also well advanced towards completion. With the new dock in position the facilities for repair work at New York will be more than doubled.

The Tropical Fruit and Steamship Co., to operate fruit steamships, etc., capital $500,000, was incorporated at Augusta, Me., recently. The incorporators are: C. A. Castle, Melrose, Mass.; F. H. Blackwell and W. H. Spooner, Boston; F. E. Rowell, Kittery, Me.

Barnegat City Steamboat Co. of Camden, N. J., has been incorporated for the purpose of operating steamships. Capital $25,000. Incorporators: B. T. Archer, I. A. Lill, I. Moffett, H. H. Voorhees and J. Morgan.

The Bath Iron Works, Bath, Me., will make repairs to the Standard Oil steamship Maverick. It will take $100,000 to put her in shape. She was burned and sunk in Halifax harbor last year.

Jackson & Sharp Co. of Wilmington, Del., launched a new barge named Atlantic for the National Lead Co., last week.

FORGINGS FOR BIG VESSELS.

The Bethlehem Steel Co. of South Bethlehem now has in hand the entire equipment of steel shafts and engine-forgings which are to go into the new steamer building by the Harlan & Hollingsworth Co. at Wilmington, Del., for the Mallory line. These forgings are to be made of a high-grade of open hearth steel, forged under hydraulic pressure and carefully annealed in accordance with the standard practice of the Bethlehem works.

The Bethlehem company is also making all the shafts and forgings for the 11,000-ton steamer which is to be built by Union Iron Works of San Francisco for account of American-Hawaiian Steamship Co. In this instance the owners saw fit to recognize the character of Bethlehem work by specifying all the parts mentioned. This is most gratifying testimony to the good effect of the campaign which the Bethlehem company has been carrying on in favor of a higher standard of material and workmanship in the large vessels that are now being built in different parts of the country.

As an evidence of progress in western engineering, it may be noted that the city engineer of Chicago recently placed with Bethlehem company an order for a hollow-forged shaft to replace a breakdown in the north side pumping station at that city. The new shaft, which measured 13 feet 8½ inches in length, 19 inches in diameter and weighed close to 10,000 pounds, was booked on May 30, and, under special emergency instructions, was hollow-forged, annealed and rough-machined in time to go forward June 9.

Many of the power stations in Chicago and other western cities are equipped with shafts of this description, but this is the first time a hollow forging has been specified for water works engines in that section of the country. The remarkably short time required by the Bethlehem plant for the production of such a shaft is worthy of note, but the manufacturers claim that their complete facilities enable them to meet just such emergencies, in addition to the large volume of general business which constitutes their regular output.

During the recent Harvard and Yale boat races on the Thames river 350 yachts, sail and steam, and excluding very small craft, were anchored at one time in New London harbor. Among the steam yachts were the Aphrodite, Kanawha, Electra, May, Susquehanna, Intrepid, Dreamer and Sea Fox. During the races the steamboats City of Lowell, Richard Peck, Block Island, Westerly, Gypsy, Summer Girl, Munnatauket and various smaller steamboats and tugs, together with the revenue cutters Gresham and Dalles, helped to swell the amount of floating tonnage to an enormous figure. During the race two observation trains with open sides, containing about fifty cars all told, followed the crews, a train being on each bank of the Thames. It is said that over 10,000 people watched the races from boats in the harbor. 3,000 from the observation trains and 7,000 from the shores, making a total of 20,000 all told.

BELLEVILLE GENERATORS.

GRAND PRIZE AT THE WORLD'S FAIR OF 1889.

List of Ocean Steamships on Board which BELLEVILLE GENERATORS are Used.

FRENCH NAVY.

Despatch Boat **VOLTIGEUR**; Squadron's Look-out Ship **MILAN**; Squadron's Look-out Ship **HIRONDELLE**; Gunboat **CROCODILE**; Despatch Boat **ACTIF**; Cruiser **AMIRAL RIGAULT DE GENOUILLY**; Iron Clad Cruiser **ALGER**; Iron Clad Cruiser **LATOUCHE-TREVILLE**; Iron Clad Cruiser **CHANZY**; Iron Clad Cruiser **AMIRAL CHARNER**; Tug **ABERVRAC'H**; Despatch Boat **CAUDAN**; Torpedo Despatch Boat **LEGER**; Torpedo Despatch Boat **LEVRIER**; Battleship **BRENNUS**; Protected Coast Guard **AMIRAL TREHOUART**; Iron Clad Cruiser **BRUIX**; Iron Clad Cruiser **BUGEAUD**; Cruiser **DESCARTES**; Battleship **BOUVET**; Cruiser **POTHUAU**; Cruiser **GALILEE**; Cruiser **PASCAL**; Cruiser **CATINAT**; Battleship **CHARLEMAGNE**; Cruiser **LAVOISIER**; Cruiser **PROTET**; Battleships **GAULOIS, SAINT LOUIS** and **HOCHE**; Iron Clad **IENA**; Cruiser **DESAIX**; Iron Clad Cruiser **DUPETIT-THOUARS**; Cruiser **DUPLEIX**; Cruiser **FURIEUX**; Battleship **NEPTUNE**; Battleship **DEVASTATION**; Cruisers **SULLY, AMIRAL AUBE** and **MARSEILLAISE**.

COMP. GENERALE TRANSATLANTIQUE: X, steamer of the Tarn class.

MESSAGERIES MARITIMES: Cargo Steamer **ORTEGAL**; Mail Steamships **SINDH, AUSTRALIEN, POLYNESIEN, ARMAND-BEHIC, VILLE-DE-LA-CIOTAT, ERNEST-SIMONS, CHILI, CORDILLERE, LAOS, INDUS, TONKIN, ANNAM, ATLANTIQUE.**

COMPAGNIE DES CHEMINS DE FER DE L'OUEST, (Plying between Dieppe and Newhaven): Freight Steamers **ANGERS, CAEN, BREST, CHERBOURG**; Fast Steamers **TAMISE, MANCHE, FRANCE.**

RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASTCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREWNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **SVETLANA**; Cruiser **DIANA**; Cruiser **PALLADA**; Torpedo Transport Boat **BAKAN**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**; Iron Clad **SINOPE.**

ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR, ARROGANT, FURIOUS, VINDICTIVE**, cruisers; **NIOBE, DIADEM, ANDROMEDA, EUROPA**, cruisers; **CANOPUS, GLORY, GOLIATH, ALBION, OCEAN**, iron clad ships; **ARGONAUT, ARIADNE, AMPHITRITE, SPARTIATE, HERMES, HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR** and **ROSARIO**, sloops; **CRESSY, ABOUKIR, SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE, FORMIDABLE** and **IRRESISTIBLE, VENERABLE, LONDON, BULWARK**, iron clad ships; **EURYALUS, BACCHANTE**, cruisers; **MUTINE, RINALDO, SHEARWATER**, sloops; **CORNWALLIS, DUNCAN, EXMOUTH, RUSSEL**, iron clad ships; **DRAKE, KING ALFRED, LEVIATHAN, AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX, KENT**, cruisers; **ALBEMARLE, MONTAGU**, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

AUSTRIAN NAVY.

BUDA-PEST, iron clad coast guard; **KAISER KARL VI**, cruiser; **X', X'"**, battleships.

ITALIAN NAVY.

VARESE, cruiser; **BENEDETTO BRIN**, battleship.

ARGENTINE REPUBLIC.

PUEYRREDON, cruiser; Steamships **PUERTO-HUERGO** and **MENDOZA.**

SPANISH NAVY.

REINA REGENTE, cruiser.

CHILIAN NAVY.

O'HIGGINS, cruiser; **ALMIRANTE LYNCH**, torpedo boat destroyer; **ALMIRANTE CONDELL**, torpedo boat destroyer; **JENERAL BAQUEDANO**, school ship.

JAPANESE NAVY.

SHIKISHIMA, iron clad; **CHIYODA**, cruiser; **ASAHI**, iron clad; **IWATE**, cruiser; **AZUMA**, cruiser; **HATSUSE**, iron clad; **ITSUKUSHIMA**, iron clad coast guard; **MIKASA**, battleship; **IZUMO**, cruiser.

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Northern Steamship Co.'s Passenger Steamers **NORTH WEST** and **NORTH LAND**, of 7,000 H. P. each; yachts **SHEARWATER, CORYELL, WILD DUCK, SULTANA.**

Cable Address: BELLEVILLE SAINT-DENIS-SUR-SEINE. **General Information Sent on Demand.**

VALUE OF CORRESPONDENCE SCHOOLS.

The International Correspondence Schools of Scranton, Pa., originators of correspondence instruction in the engineering trades, will shortly give to young men aboard vessels on the great lakes an opportunity to take up a course in navigation, prepared especially for the lakes. No circulars describing the navigation course have as yet been issued, as the details have not been perfected, but the work will undoubtedly be handled in the very thorough and practical way in which all undertakings of this great institution have been carried out. The Scranton schools are one of the wonders of American ingenuity and enterprise. Of course it is not claimed that the thousands of students in the engineering trades and professions entering into correspondence with these schools are given an education equal to what they would derive from attendance at a technical college, but there are cases where the results are certainly more advantageous when combined with practical knowledge. The charges, $12 to $70 in monthly installments, are so small as to place the different courses within reach of any young man who is progressive enough to seek this kind of education.

Among the assistant engineers of vessels in all parts of the United States the schools have been working for a long time past. H. A. Lindsley of 58 Clinton street, Cleveland, says: "While engaged as an oiler on a steamer I enrolled in the marine engineer's course. Last winter I was a successful candidate for engineer's license, and this spring got a position as such. The oiling paid from $30.00 to $37.00 per month; the engineering $70.00. I feel satisfied that the schools were a help to me in securing a license and that I will have no difficulty in securing a raise of grade as soon as I have put in sufficient time on my present grade."

GROWTH OF THE NORTH GERMAN LLOYD.

The North German Lloyd Steamship Co. will enter the new century with a fleet (including vessels in course of construction) of 101 ocean steamers, twenty-eight river steamers and tugs, and 115 other river craft, with a gross measurement of 496,169 registered tons. The fleet comprises eleven fast steamers, thirteen imperial mail steamers and thirty-five mail steamers. Out of these twenty-eight have twin-screws, and thirteen of them have a register of more than 10,000 tons; the aggregate horse power of the engines of the steamers is about 397,010. The company maintains twenty-two different services, and the number of persons in its service will, after the manning of the new steamers, comprise crews to the number of 9,300 men and 1,900 officials and men employed in the repair works, making a total of 11,200 persons, which figure does not, of course, include the number of cargo workmen at different ports. In the inter-oceanic traffic the company has transported so far about 3,500,000 passengers. In the course of last year the steamers of the company passed over an aggregate distance of 3,545,000 nautical miles, equal to about 164 times the circumference of the globe.

Kroonland and Finland are the names selected for the two large Atlantic liners which the Wm. Cramp & Sons Co. is building at Philadelphia for the International Navigation Co. These vessels are each 560 feet and the registered tonnage of each will be about 12,000.

TRADE NOTES.

A Pittsburg office has been opened by the American Tool Works Co. of Cincinnati. The agent is Mr. L. V. Blue, who is located at No. 1212 Carnegie building.

"We are more than pleased with the down-draft forges furnished by you about two years ago," says Mr. A. H. Morton of the Kitson Machine Co., Lowell, Mass., in a letter to the Buffalo Forge Co., Buffalo, N. Y. "We have had no trouble with smoke from our blacksmith shop since their adoption."

Mr. Edw. N. Hurley, president of the Standard Pneumatic Tool Co., Chicago, has sailed for Europe, for the purpose of establishing works in Germany and France. The Standard company now has large works in Chippenham, near London, but on account of the increased trade on the continent it has been deemed advisable to establish additional works in the countries mentioned. Mr. Hurley will also be in attendance at the Paris exposition, where the Standard company has two large exhibits in Champ de Mars and Park Vincennes. He expects to return in the course of a couple of months.

"We are quoting a good many prospective buyers on our tools," says the Cleveland Punch & Shear Works Co., Cleveland, O., and we are receiving many new orders for fall delivery. During the past week we have shipped the following tools: A heavy pole cap press for the Milwaukee Wagon Iron Works; a No. 2 metal saw for the Ajax Mfg. Co.; a rotary planer with 16-foot bed and 50-inch cutting head for the Camden Iron Works; a 12-foot radial wall drill for the Pennsylvania Iron Works; an 18-inch throat punch for the Vulcanus Forging Co., and a 10-foot radial drill for the Oil Well Supply Co."

U. S. Engineer Office, Jones Building, Detroit, Mich., June 20, 1900. Sealed proposals for dredging Rouge River, Mich., and Black River at Port Huron, Mich., will be received here until 12 noon (standard time), June 30, 1900, and then publicly opened. Information furnished on application. G. J. Lydecker, Lt. Col., Engrs. June 28

U. S. Engineer Office, Buffalo, N. Y., June 20, 1900. Sealed proposals for construction of concrete superstructure on south pier at Buffalo, N. Y., will be received here until 11 a. m., July 10, 1900, and then opened. Information furnished on application. T. W Symons, Major, Engrs. July 5

Sealed proposals for furnishing armor for naval vessels will be received at the Navy Department until 12 o'clock, noon, August 10, 1900, when they will be publicly opened. Forms of proposals and all necessary information may be obtained from the Chief of the Bureau of Ordnance, Navy Department, Washington, D. C. F. W. Hackett, Acting Secretary. 6-18-1900. July 28

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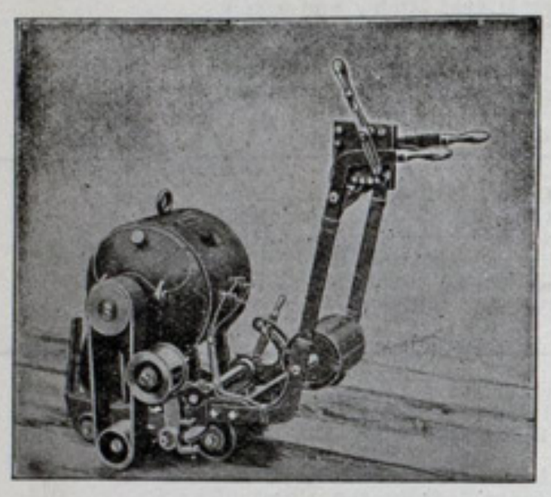

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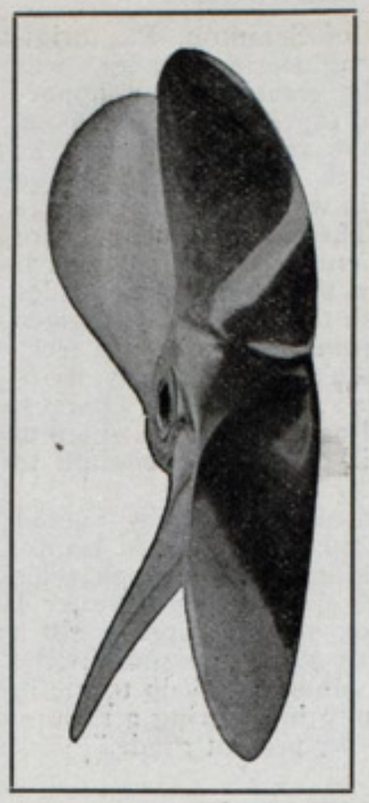

West Superior, Wis., Oct. 25, 1899.

A. Wells Case & Son,
Highland Park, Conn.—

Gentlemen: Your favor of the 16th inst. duly received. As I have stated before, the 32-inch wheel you sent me early this season has given entire satisfaction. We are able to turn up with it nearly as many turns as we did with the 28-inch wheel and get about a mile an hour more speed out of it. I could only confirm other testimonials you have to the effect that your wheel is the most satisfactory I have ever had any experience with. It may be that I shall build a larger boat during the winter, and if so will certainly call upon you for a wheel for it.

Yours very truly,
ROBERT KELLY.

Greenport, N. Y.

Messrs. A. Wells Case & Son,
Highland Park, Conn.—

Sirs: I have been experimenting with propeller wheels on steam and gas engine boats for nine years, and desire to place myself on record as saying that without doubt the Case wheel is the best to date. Our launch, the Vigo, is equipped with a 16-horse-power Russ motor and a Case wheel, and the combination has produced the fastest naphtha launch of her size afloat. She is 40x7½x3½, and has a trial speed of 12½ miles. With best wishes for the future success of the Case wheel, I am,

Yours very truly,
H. C. MONSELL.

Elkhart, Ind., Feb. 1st, 1900.

A. Wells Case & Son,
Highland Park, Conn.—

Gentlemen: Your favor of Jan. 29th is just here. Your wheel on the Sultana gives most excellent satisfaction. I believe it to be the best wheel manufactured and advise all owners of steam yachts, who desire to increase the speed of their boats, to adopt it. If I can be of any service to you in recommending the Case wheel to prospective buyers, kindly refer them to me.

With best wishes, I am, Truly yours,
C. G. CONN.

Crown Island, N. Y., Sept. 22, 1899.

Messrs. A. Wells Case & Son,
Highland Park, Conn.—

Gentlemen: I have now given the wheel you sent me a fair test and can say that it surpasses anyof the other four wheels which I have had on the Crusader. The vibration is less and the strain on the engine is less and speed is greater. Another season, I hope to have you make me a special bronze wheel and I believe you can give me still more speed.

Very truly yours,
W. T. WELLS.

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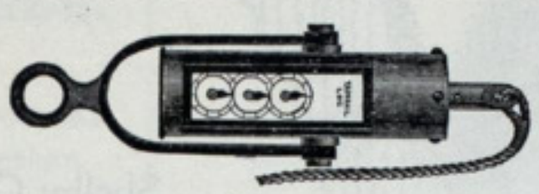

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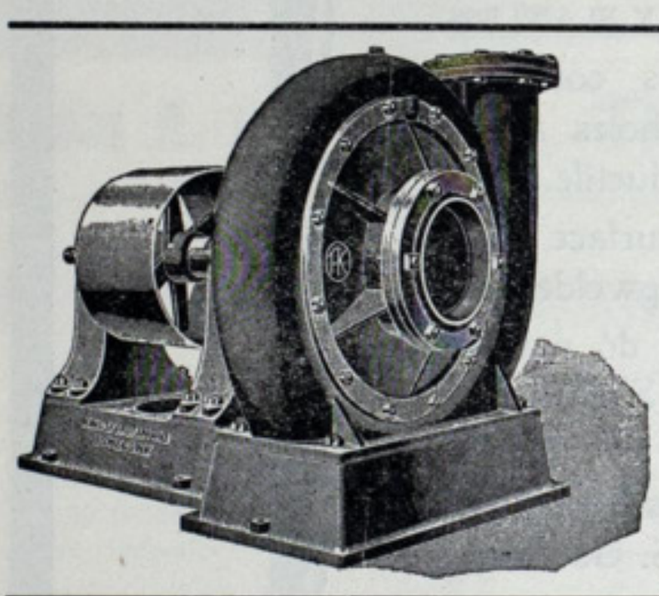

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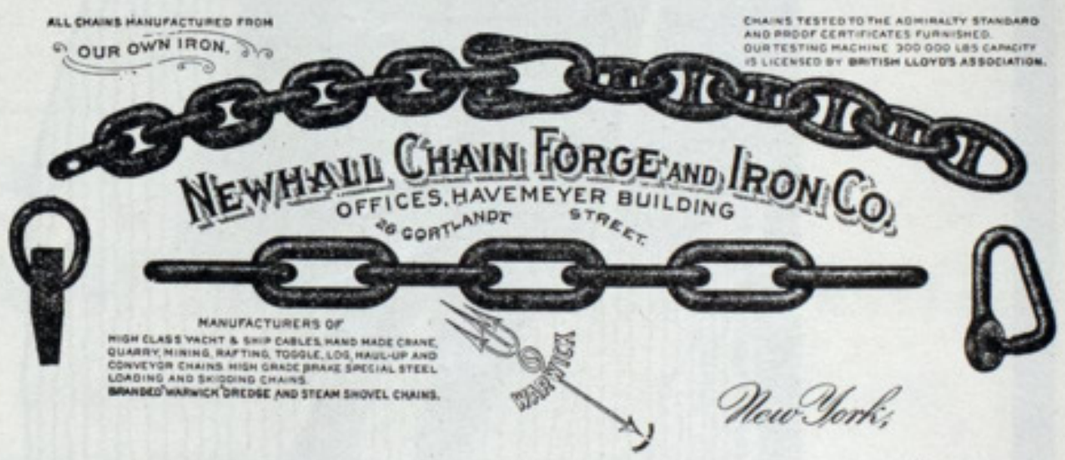

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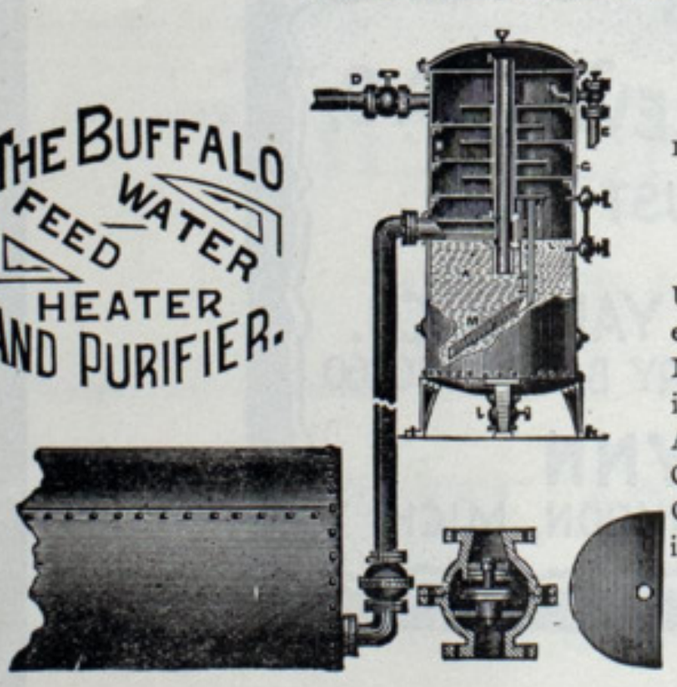

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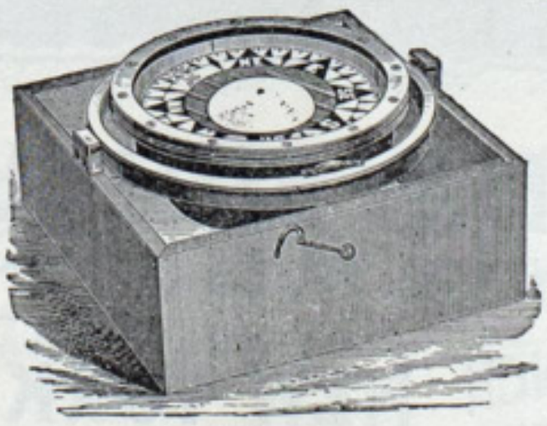

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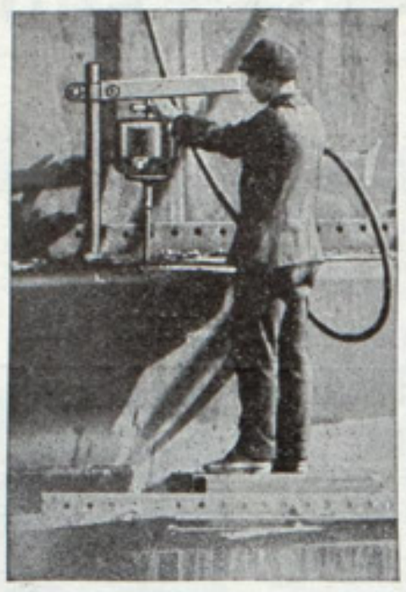

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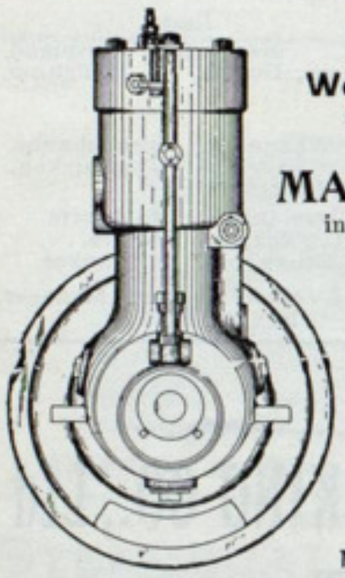

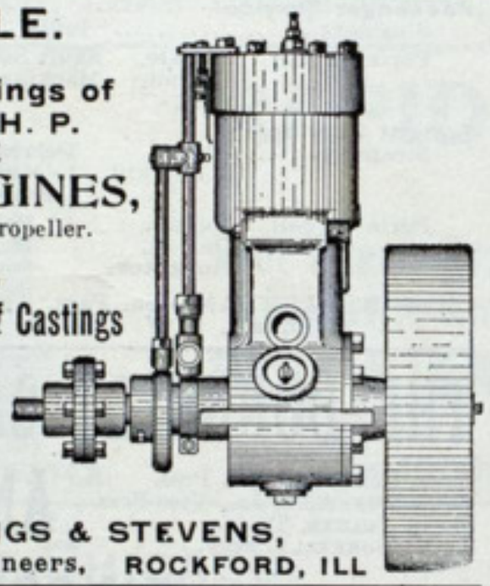

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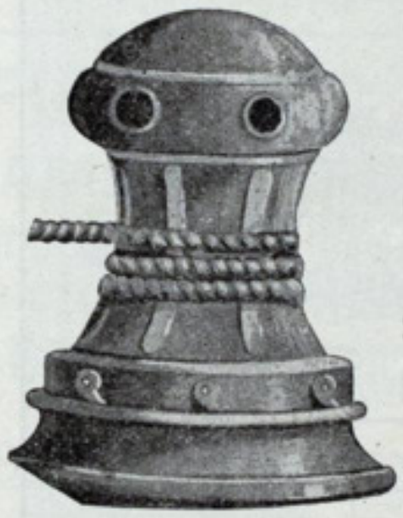

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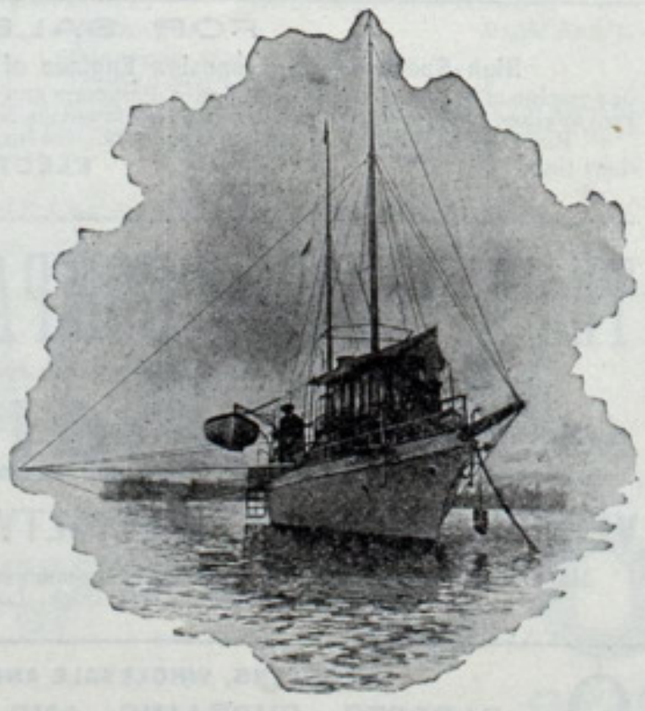

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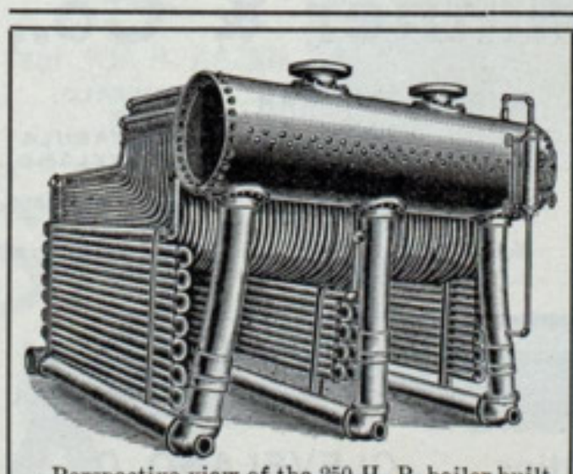

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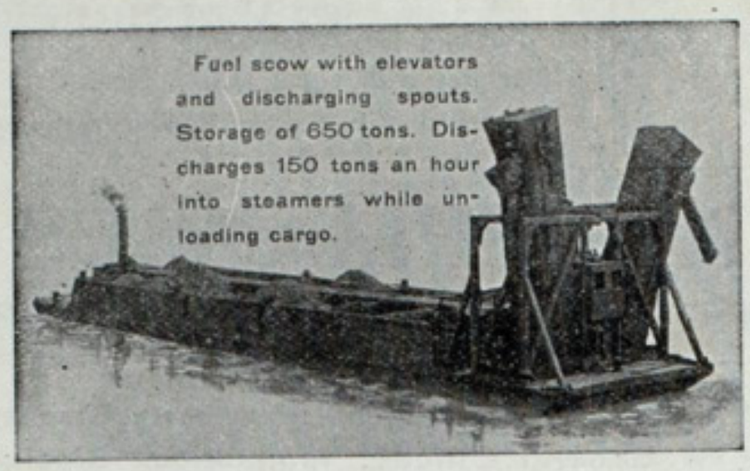

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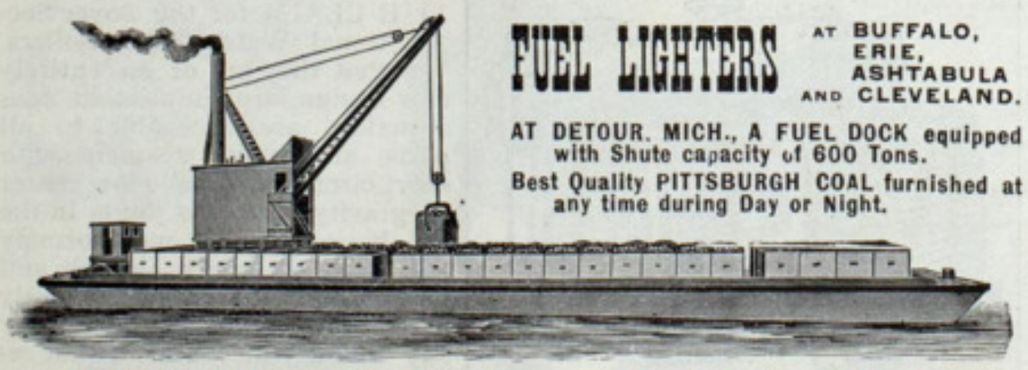

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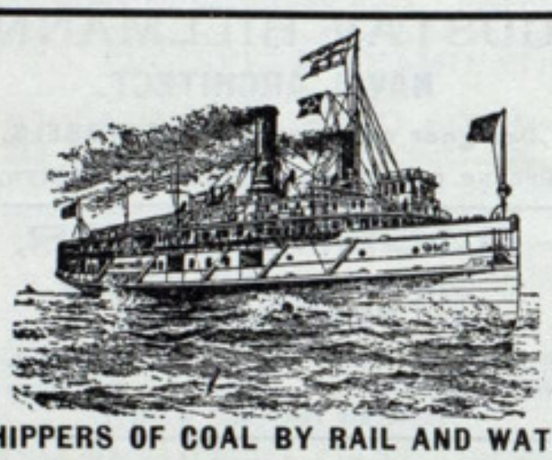

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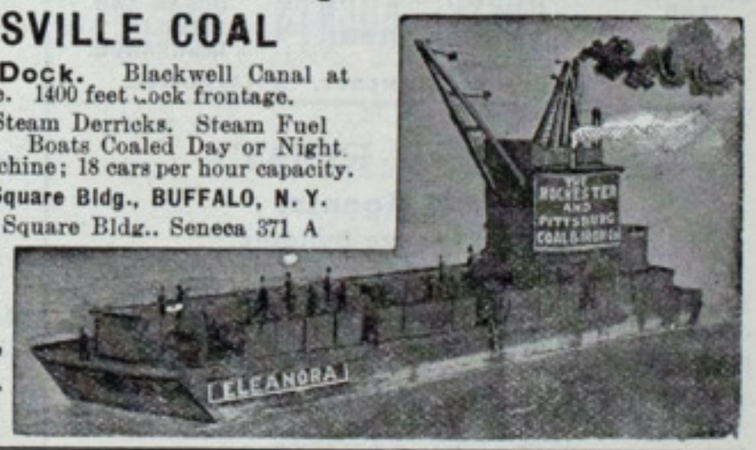

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See accompanying Index of Advertisers for full addresses of concerns in this directory.

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AXLES, SOLID AND HOLLOW.

Bethlehem Steel Co.....So. Bethlehem, Pa.

BABBITT METAL.

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Magnolia Metal Co.....New York.
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Cleveland Punch & Shear Works Co.....Cleveland.
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Boston & Lockport Block Co.....Boston, Mass.
Cleveland Block Co.....Cleveland.
Donohue & Co., John T.....Baltimore.

BLOWERS.

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Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

BOAT NAILS AND SPIKES.

American Steel & Wire Co.....Chicago.

BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated.....New York.
Lane & DeGroot.....Brooklyn.

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American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Babcock & Wilcox Co.....New York.
Bath Iron Works, Ltd.....Bath, Me.
Boyer Water Tube Boiler Co.....New York.
Chicago Ship Building Co.....Chicago.
Cramp, Wm. & Sons.....Philadelphia.
Dearing Water Tube Boiler Co.....Detroit.
Delaunay, Belleville & Co.....St. Denis, France.
Detroit Screw Works.....Detroit.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co.....Morris Heights, N. Y.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Kingsford Found'y & Machine Works.Oswego, N. Y.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roberts Safety Water Tube Boiler Co....New York.
Stirling, The Co.....Chicago.
Trigg, Wm. R. Co.....Richmond, Va.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

BOILER COMPOUNDS.

Dearborn Drug & Chemical Works.....Chicago.

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Shelby Steel Tube Co.....Cleveland.

BOILER FURNACES, FIRE FRONTS, ETC.

Continental Iron Works.....New York.

BOILER RIVETS.

Bourne Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BOLT CUTTERS.

American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

BORING AND TURNING MILLS.

American Tool Works Co. (The).....Cincinnati
Niles Tool Works Co.....Hamilton, O.

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Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Phosphor Bronze Smelting Co.....Philadelphia.

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Hungerford Brass & Copper Co., U. T.....New York.

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Berlin Iron Bridge Co.....East Berlin, Conn.
Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Mach. Co..Cleveland.
McMyler Mnfg. Co.....Cleveland.
Webster, Camp & Lane Machine Co.....Akron, O.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

CAPSTANS.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

CHAINS.

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Monongahela Iron & Steel Co.....Pittsburg.
Newhall Chain Forge & Iron Co.....New York.
Standard Chain Co.....Pittsburg.

CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.

CHUCKING MACHINES.

American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

CIRCULATOR EQUILIBRIUM, with Steam Heating Attachment.

Bloomsburg & Co., H.....Newport News, Va.

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Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

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Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
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Rochester & Pittsburgh Coal & Iron Co....Buffalo.
Scott Co., W. L.....Erie, Pa.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting & Conveying Mach. Co..Cleveland.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COMPASS ADJUSTER.

Simpson, Geo. A.....Sault Ste. Marie, Mich.

COPPER SHEET, WIRE AND ROD.

Hungerford Brass & Copper Co., U. T.....New York.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

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International Correspondence Schools.....Scranton, Pa.

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Brown Hoisting & Conveying Mach. Co..Cleveland.
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General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
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Bethlehem Steel Co.....Bethlehem, So. Pa.

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Dallett, Thos. H. & Co.....Philadelphia.

DECK SEAMS, COMPOSITION FOR.

Cole & Kuhls.....Brooklyn, N. Y.

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Ingersoll-Sergeant Drill Co.....New York.

DRILL PRESSES—DRILLS OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

DRILLS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

DRYING APPARATUS.

Sturtevant Co., B. F.....Boston.

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American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
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Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Marine Iron Co.....Bay City.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

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Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

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Hawgood & Moore.....Cleveland.
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Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
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Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

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Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

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American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

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Gas Engine & Power Co.....New York.

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Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.

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Phenix Metallic Packing Co.....Chicago.
Sterling Lubricator Co.....Rochester, N. Y.

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American Tool Works Co. (The).....Cincinnati.
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Pelton Engineering Co.....Cleveland.

MACHINE TOOLS (WOOD WORKING).
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

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Fogg, M. W.....New York.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.

NAVAL ARCHITECTS.
Curr, Robert.....Cleveland.
Hillman, Gustav.....Brooklyn.
See, Horace.....New York.
Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.
Bethlehem Steel Co.....So. Bethlehem, Pa.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Jos.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

PLUMBING, MARINE.
Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.
Kenney, The Co.....New York.

PNEUMATIC TOOLS.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Case, A. Wells & Son.....Highland Park, Conn.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co.....Weymouth, Mass
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

PROJECTORS, ELECTRIC.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Donohue & Co., John T.....Baltimore.
Kingsford Foundry & Machine Works..... Oswego, N. Y.
Van Duzen, The E. W. Co.....Cincinnati.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
American Tool Works Co. (The).....Cincinnati.
Cleveland Punch & Shear Works Co.. ...Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER INSULATED WIRES.
Roebling's Sons, John A..New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SCHOOLS, CORRESPONDENCE—ENGINEERING AND NAVIGATION.
International Correspondence Schools.....Scranton, Pa.

SCREW MACHINES.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

SEARCH LIGHTS.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

SEPARATORS, (CENTRIFUGAL).
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

SHAPERS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Marine Supply Co.....Fairport Harbor, O.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEEL OR IRON STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.

Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Donohue & Co., John T.....Baltimore.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.

STOKERS FOR MARINE SERVICE.

American Stoker Co.....New York.

STOCKS, BONDS, SECURITIES.

Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.

Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.

Berlin Iron Bridge Co.....East Berlin, Conn.

SURVEYORS, MARINE.

Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

TELEGRAPH—DECK AND ENGINE ROOM.

Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.

Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THRUST COLLARS FOR PROPELLER SHAFTS.

Ball Bearing Co.....Boston, Mass.

TIMBER—LARGE PIECES.

Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

American Tool Works Co. (The).....Cincinnati.
Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co. ...Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

TOOLS, WOOD WORKING.

Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

TRUCKS.

Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.
Playfair's Barge & Tug Line.....Midland, Ont.

TOWING COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING FOR BOILERS.

Atlantic Tube Co.....Pittsburg.
Shelby Steel Tube Co.....Cleveland.

TUBES, SEAMLESS DRAWN, BRASS AND COPPER.

Hungerford Brass & Copper Co., U. T.....New York.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.

Smith, Edward & Co.....New York.

VARNISH PAINT.

Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Bull & Co, A. H.....New York.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant Co., B. F.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.

American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

WINDLASSES.

American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.

American Ship Windlass Co.....Providence, R. I.
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WOOD WORKING MACHINERY.

Fay & Egan Co., J. A.....Cincinnati, O.
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WORM GEARING.

Morse, Williams & Co.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.

Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.

YACHT, MARINE AND SHIPS' BELL CLOCKS.

Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

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No. 46, Southwestern Express	.....	*3 00 pm
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No. 126, Norwalk Accommodation	†7 55 am	.....
No. 40, Toledo & Buffalo Accom., via Norwalk.	†10 00 am	†10 30 am
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No. 116, Conneaut Accommodation	.....	†4 30 pm

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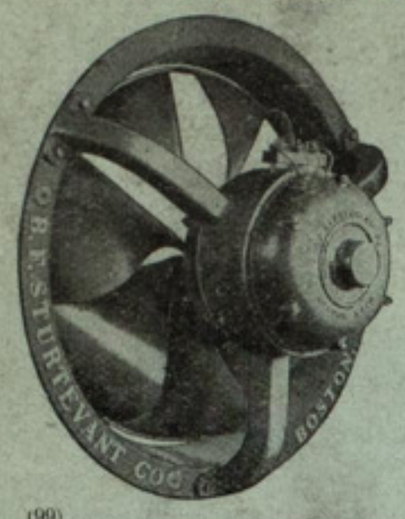

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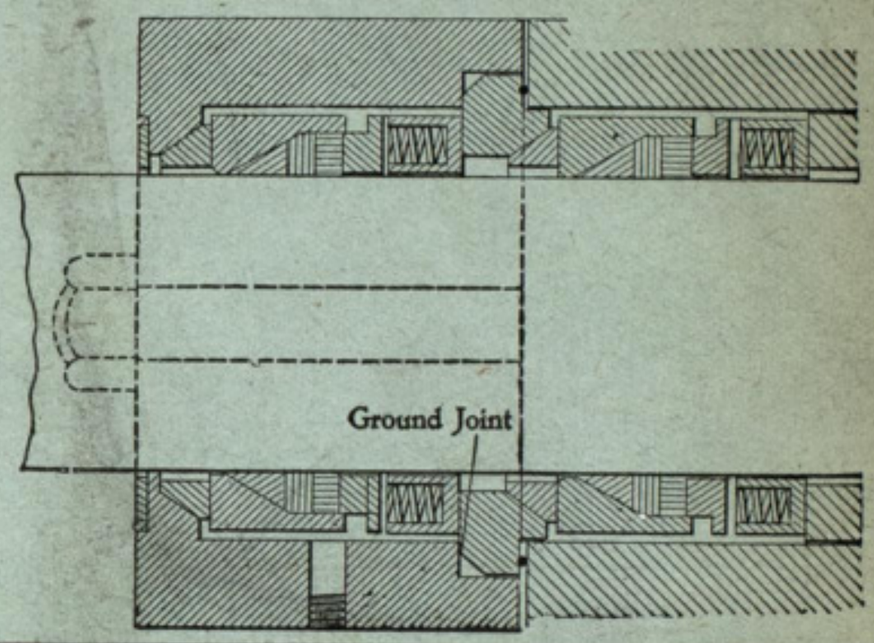

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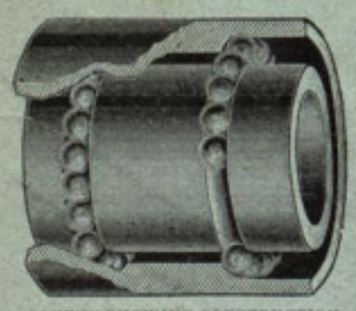

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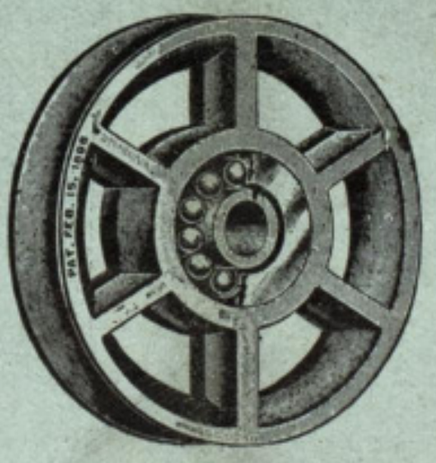

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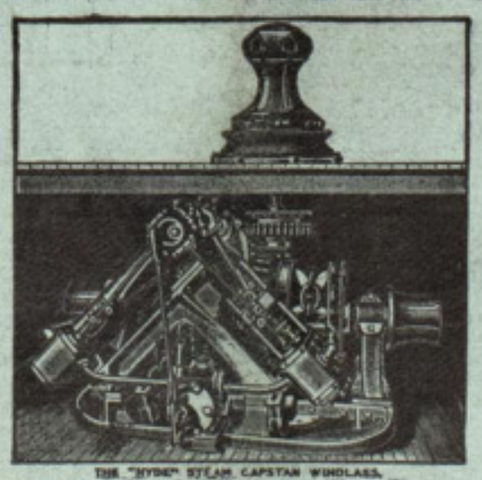

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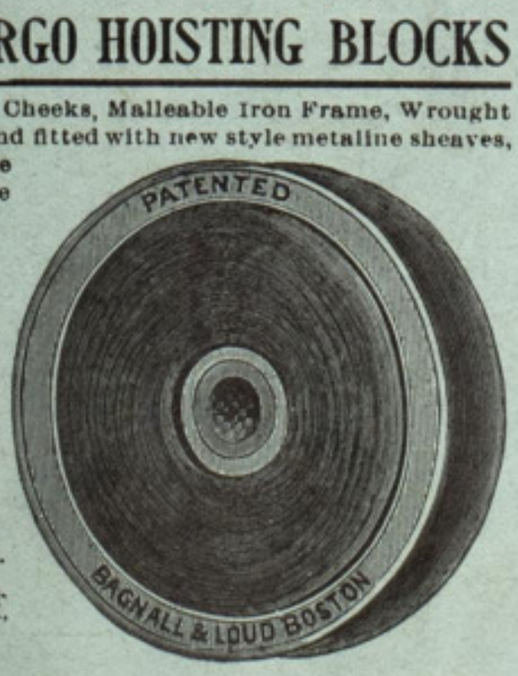

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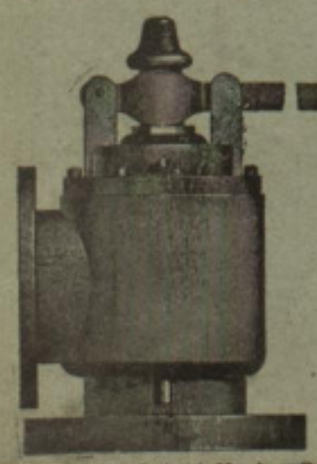

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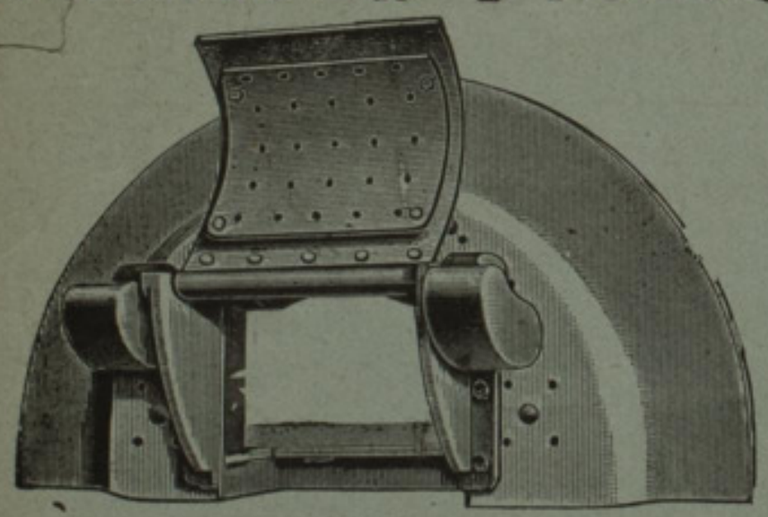

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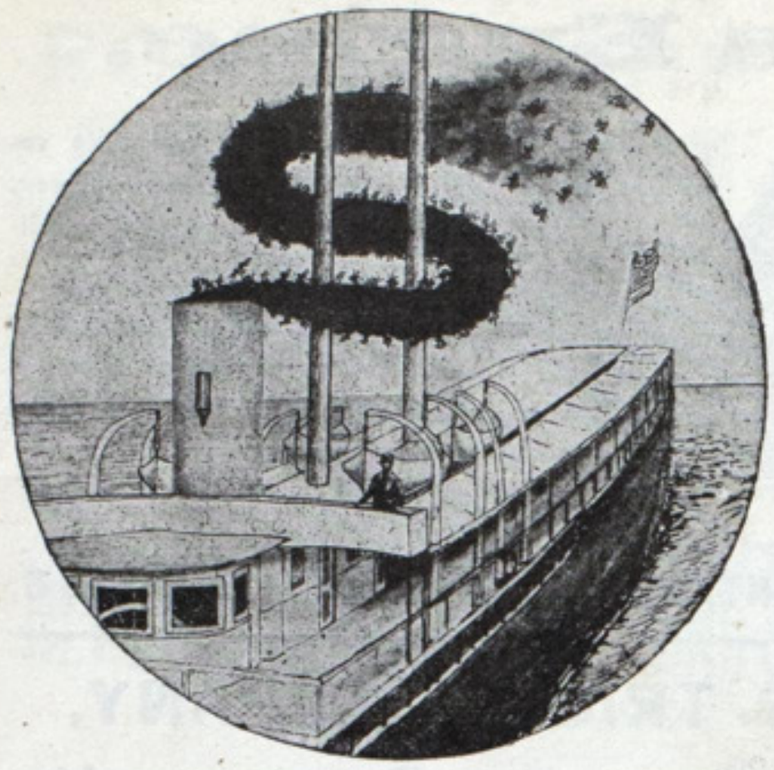

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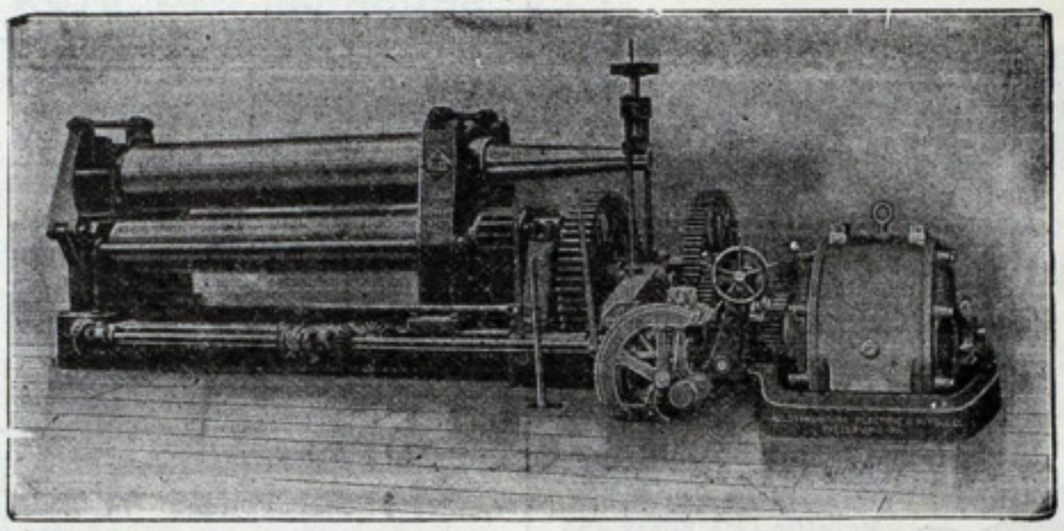

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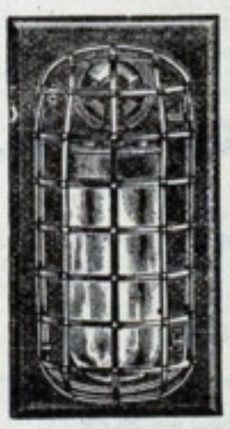

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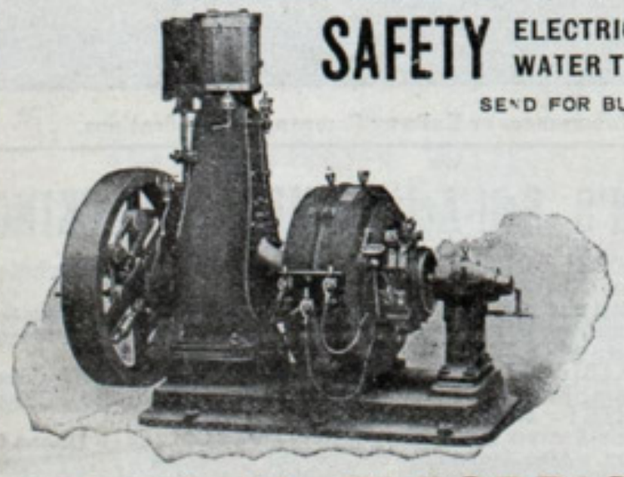

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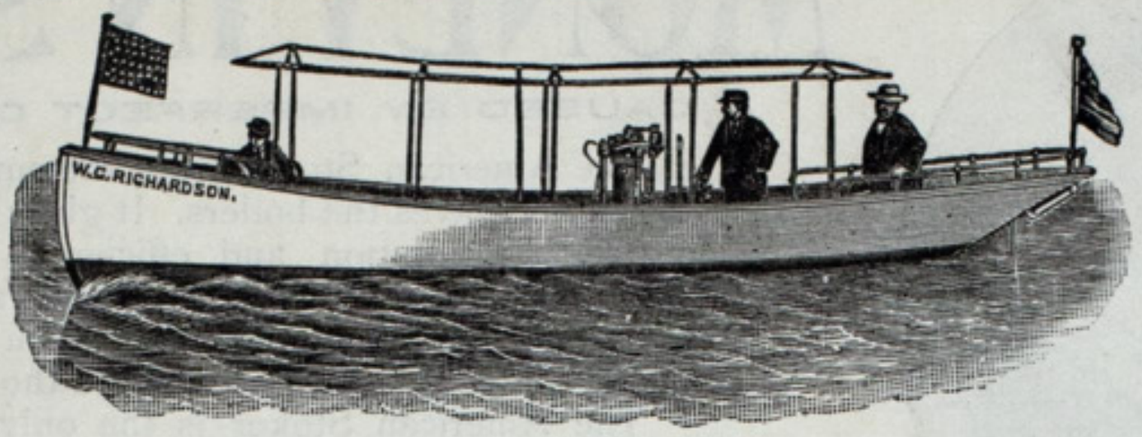

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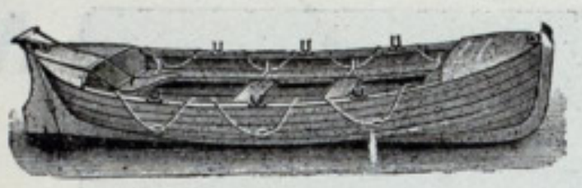

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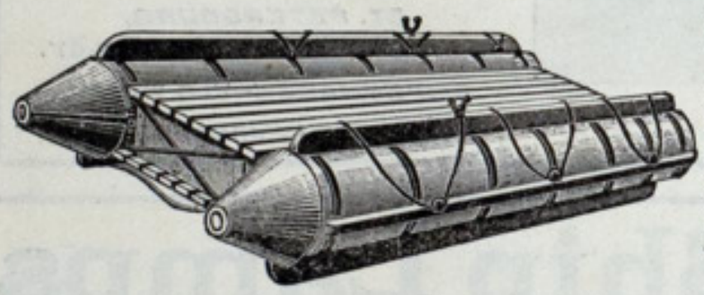

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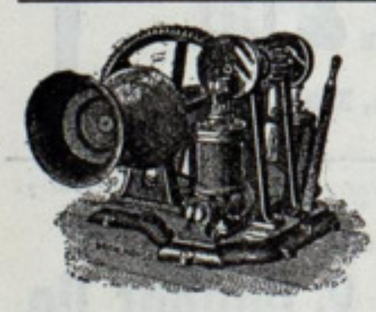

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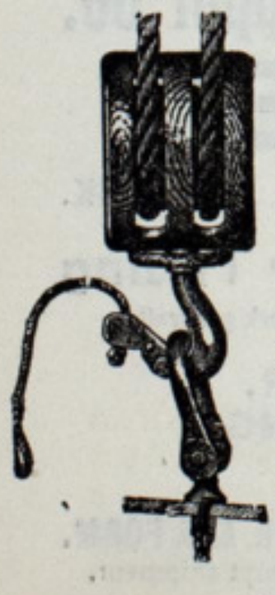

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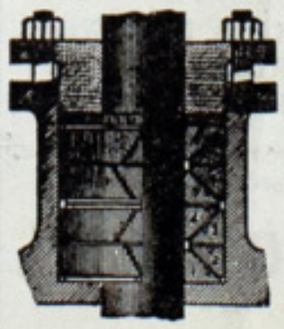

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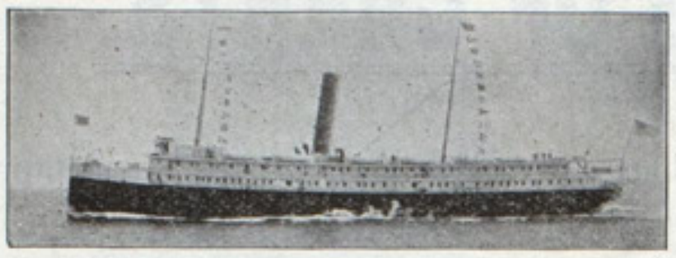

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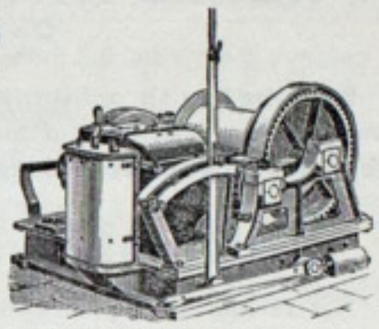

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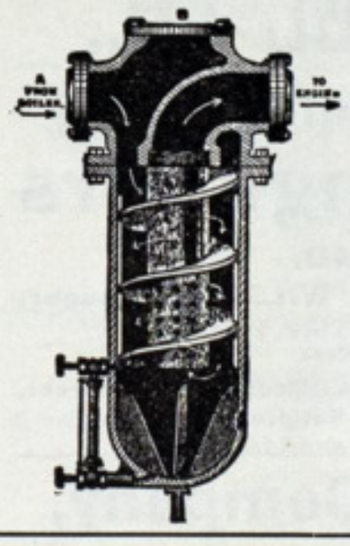

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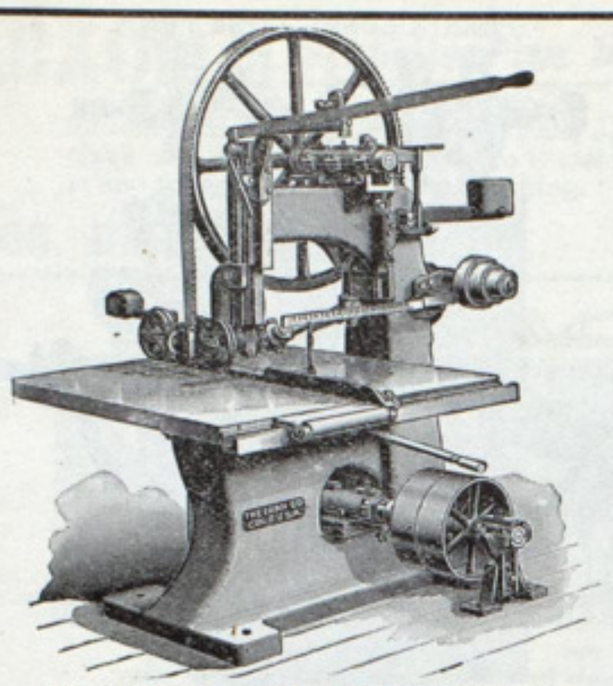

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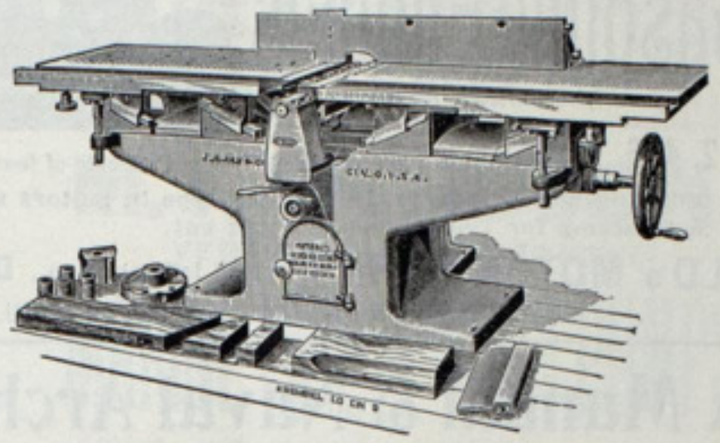

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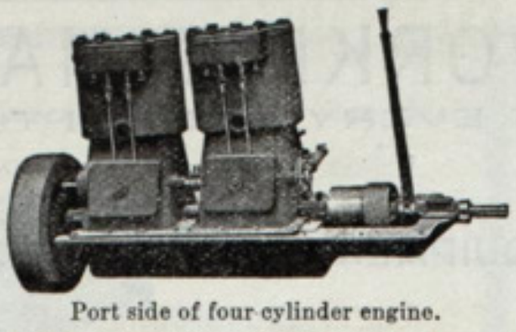

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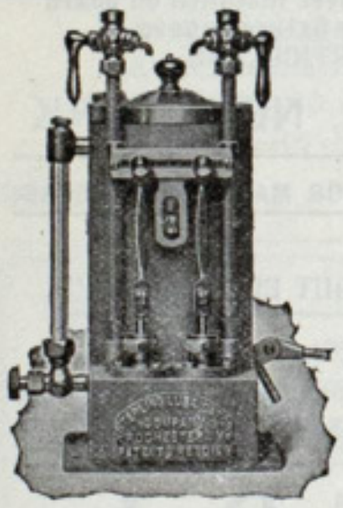

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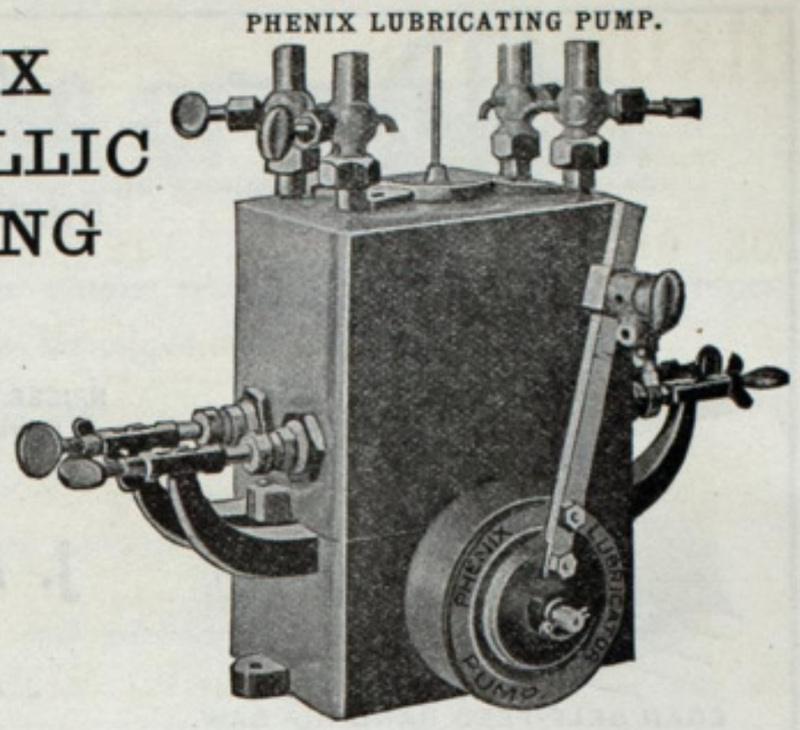

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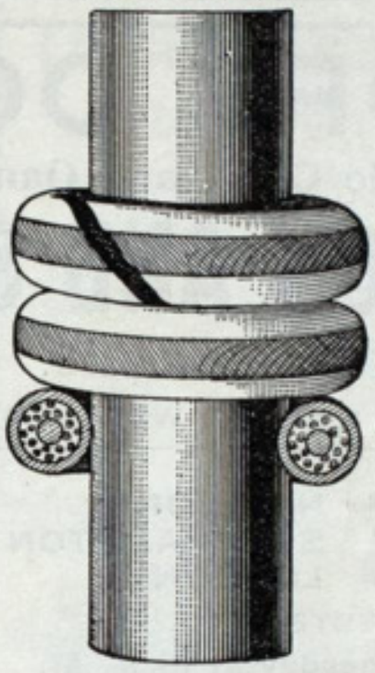

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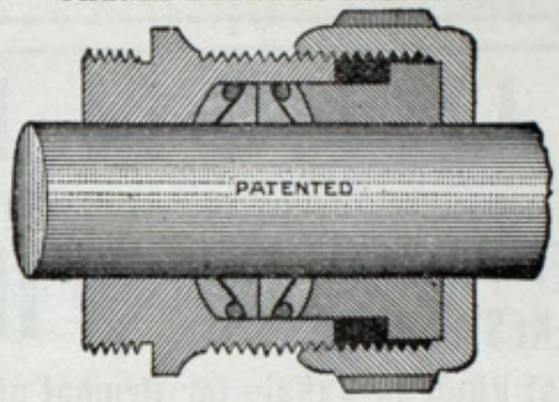

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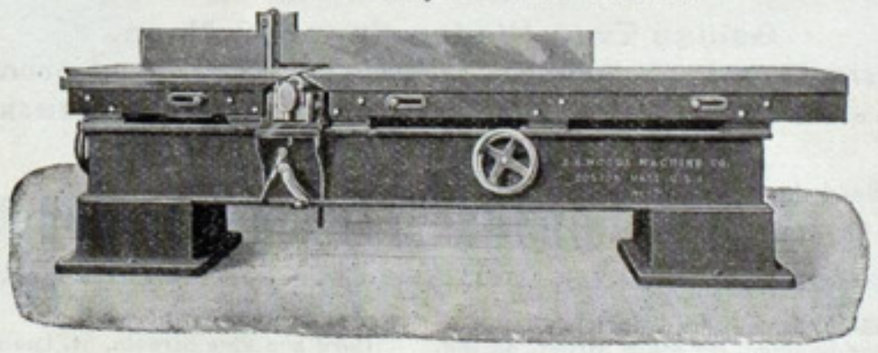

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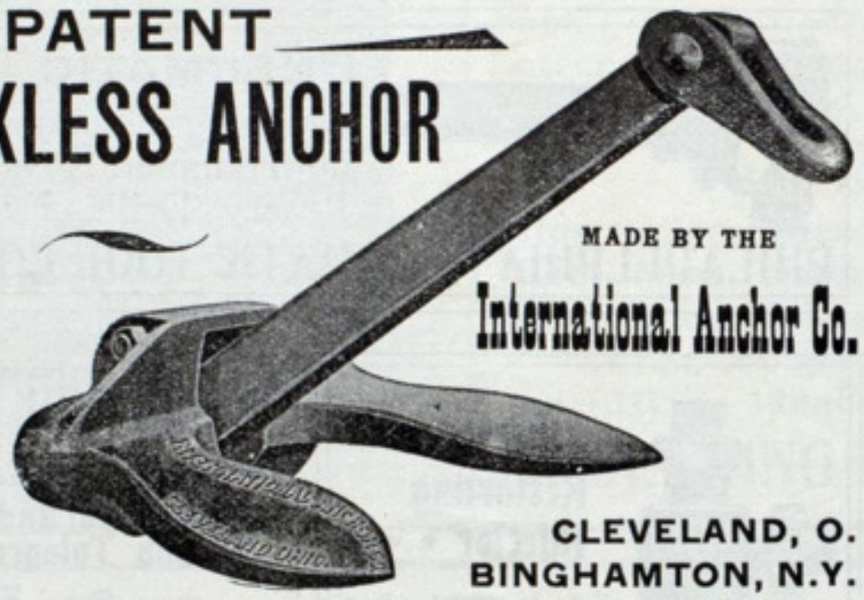

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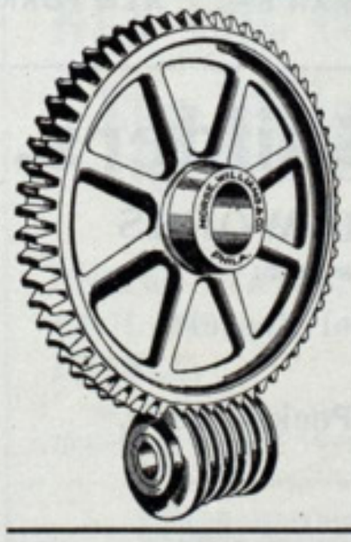

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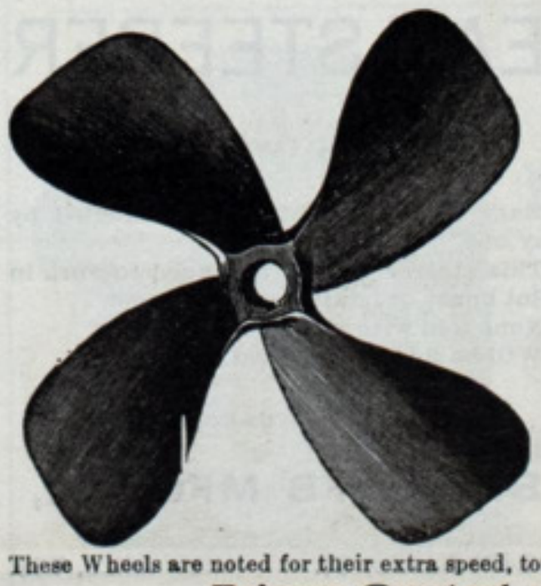

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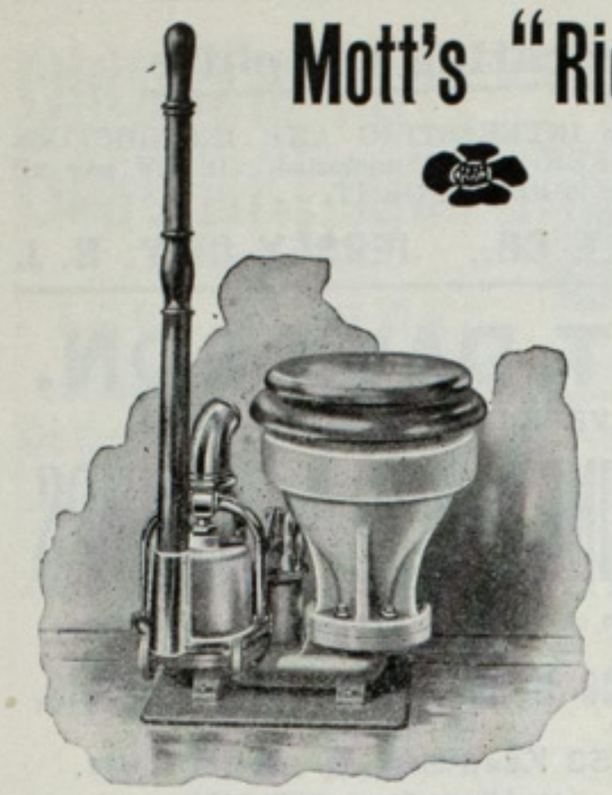

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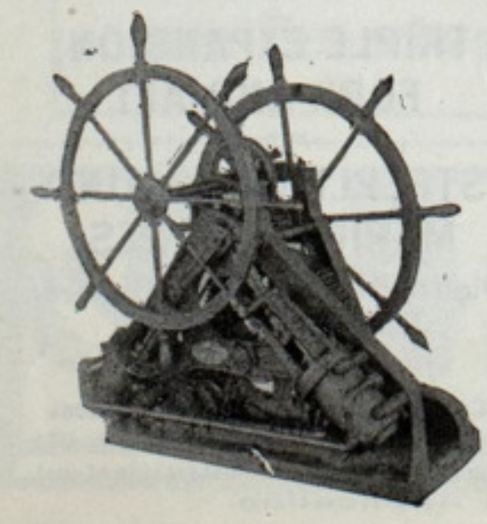

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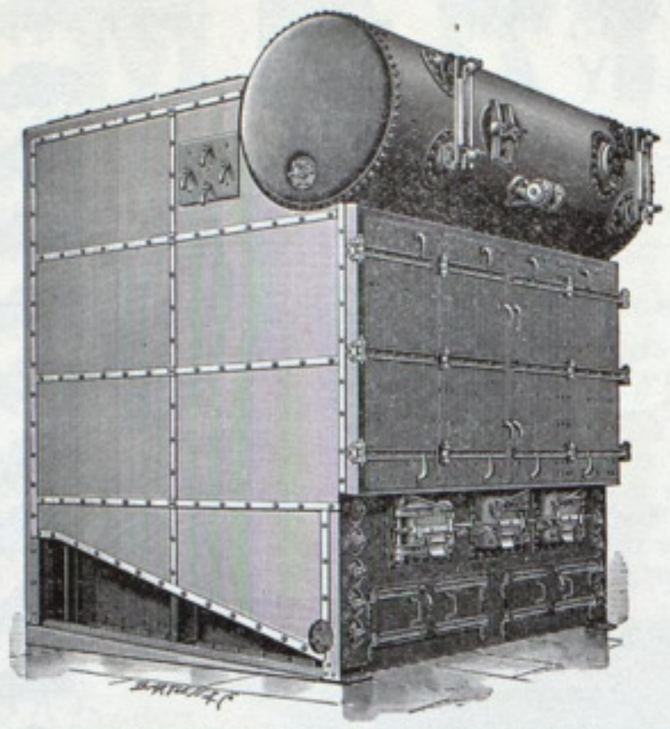

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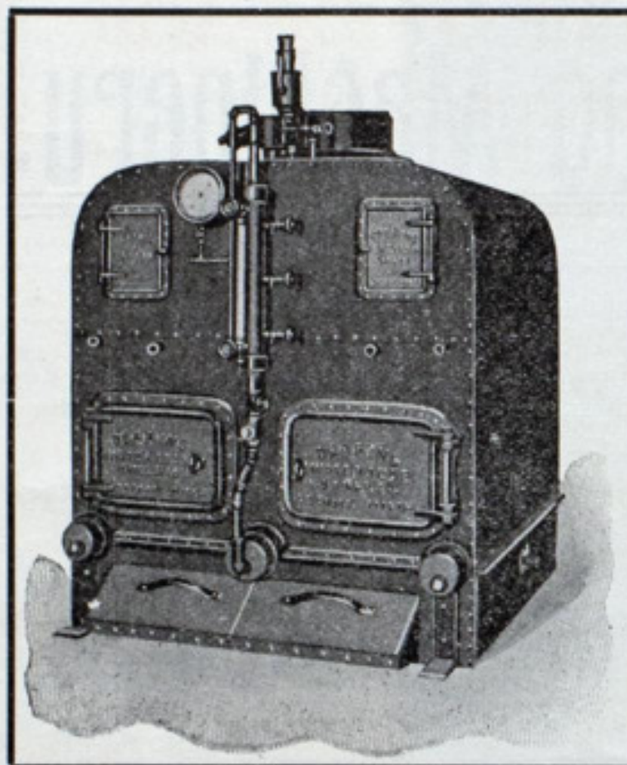

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In severe service such as every marine Boiler is occasionally subjected to, engineers frequently have trouble caused by water being carried over from the Boiler to the engine. This is always attended with danger of damage to the engines, and with loss of Boiler efficiency.

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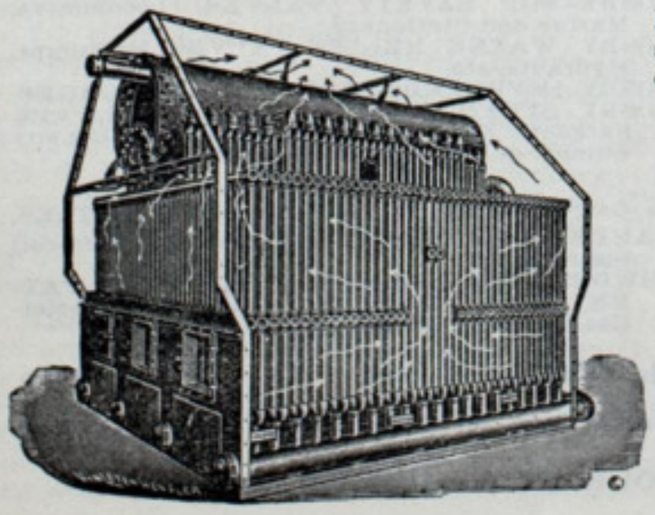

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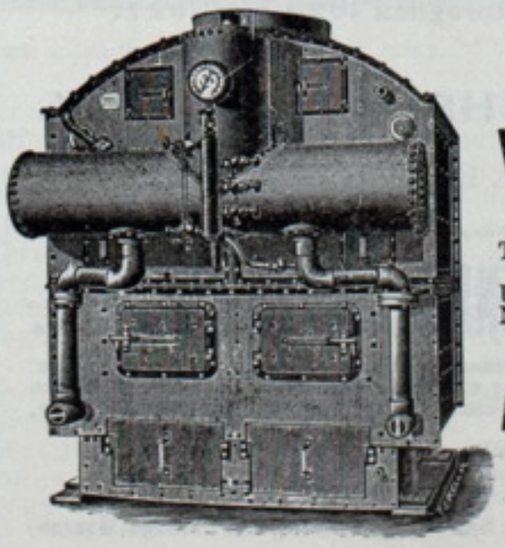

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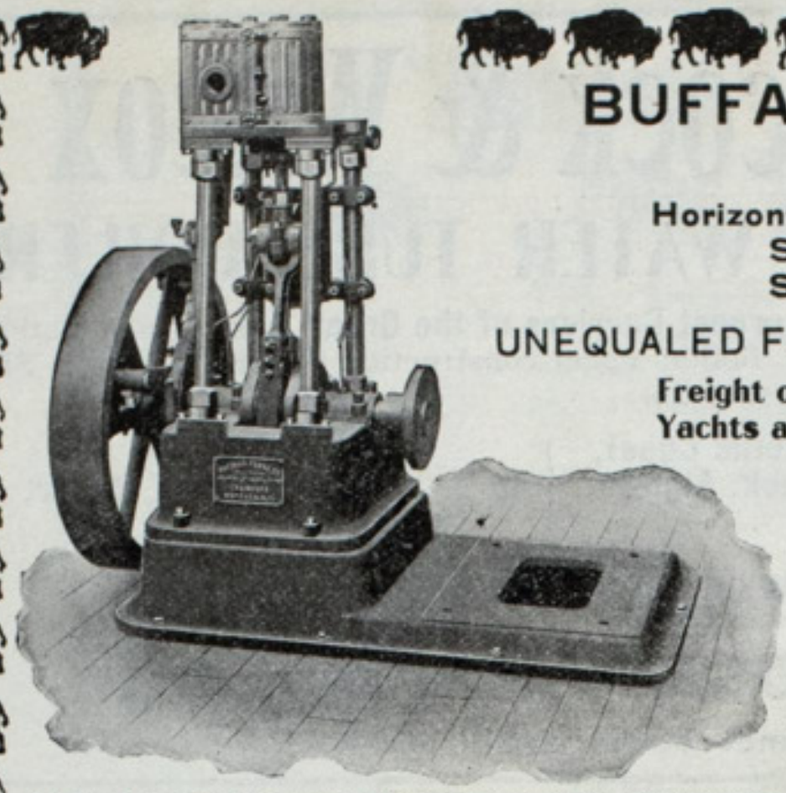

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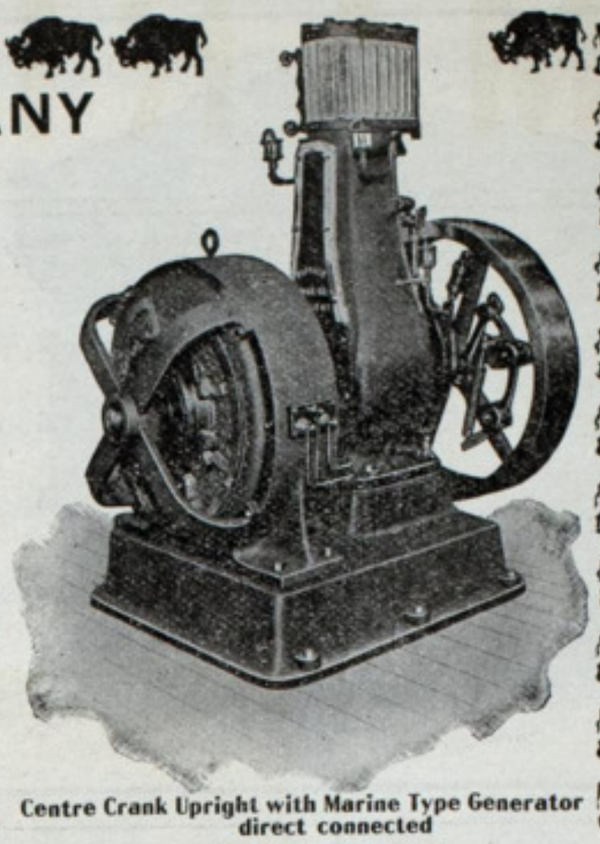

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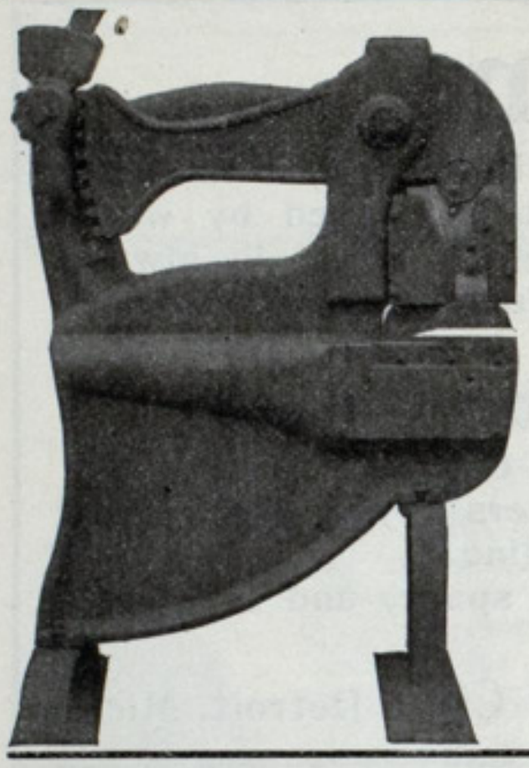

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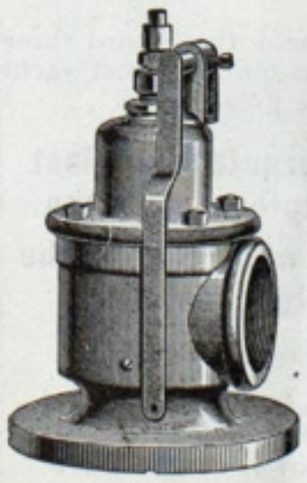

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